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JUNE 1952

BUSINESS · ENGINEERING · INDUSTRY

REPORT TO MANAGEMENT

FACTORY OF THE FUTURE

PAGE 57

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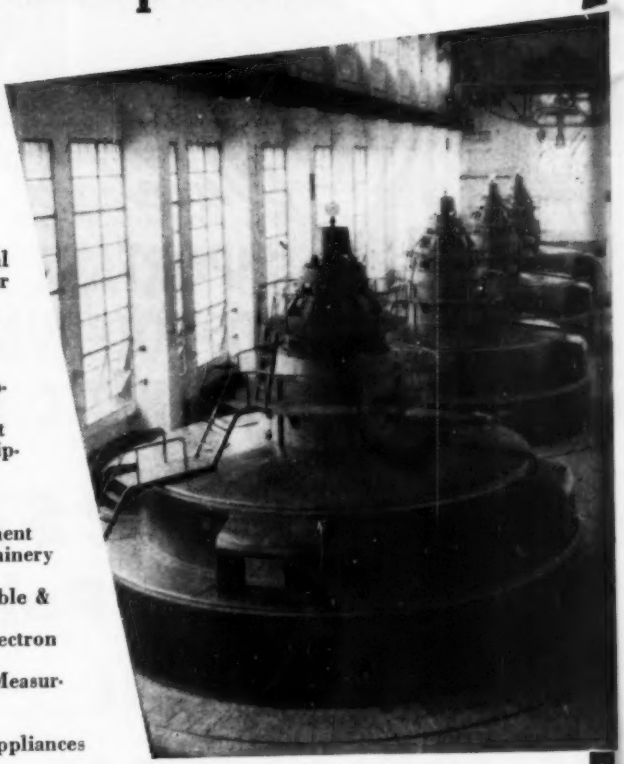

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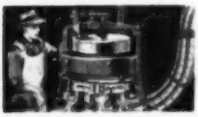

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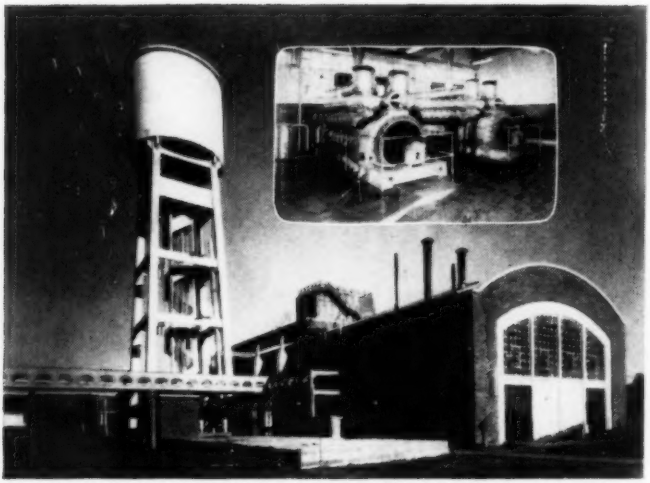

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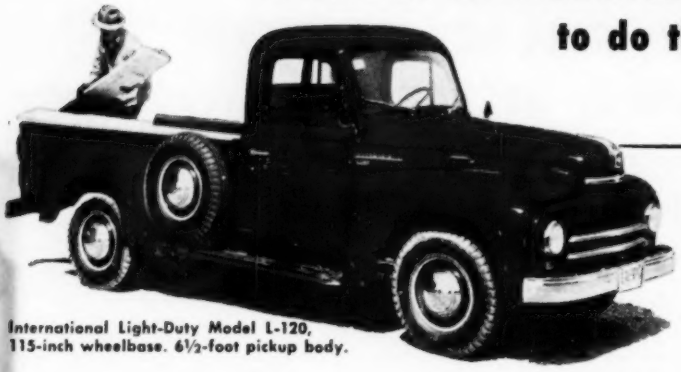

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BUSINESS TRENDS

U. S. EXPORTS may set a record in 1952. They may reach $17-billion—$2-billion above the level of last year. But all the increase will be in military shipments. Non-military exports are expected to decline.

A drop in non-military exports is clearly indicated in light of changing world economic conditions. Non-military exports were about $13.8-billion in 1951. But this total had special causes; it was boosted by extra-large shipments of tobacco and cotton in the last quarter.

These big shipments will not likely be repeated. World textile slump has reduced overseas demand for U. S. cotton. And import restrictions in the sterling area will cut U. S. tobacco exports.

Dollar shortages in sterling countries and Europe are only one cause of a fall in U. S. exports. Demand for consumer durables abroad is weak. Production of competitive products is rising in other countries. Result: Even countries outside the dollar-poor sterling area, notably Canada and South American nations, will buy less from the U. S. in 1952. Decline in non-military shipments may add up to $1.5-billion or more.

Military exports will more than make up this loss. They may total more than $4-billion in 1952. And these shipments will be made regardless of Congressional action to cut foreign aid. They can be paid for out of the unused part of the $11-billion appropriated by Congress in the past. Shipments so far have added up to only about $1.3-billion.

So over-all export totals will rise. But the rise will be deceptive. It tends to obscure the main fact in the 1952 foreign-trade outlook: Competition for civilian export markets is growing, getting tougher.

U. S. imports will stay high in 1952, may come close to last year's record of more than $11-billion. Imports fell in the second half of 1951 when the U. S. refused to buy many commodities at high prices and lived off its strategic stockpile and private inventories. But now prices are down, and buying of many commodities has been resumed. Imports of tin, rubber, and wool should rise through the year.

MOUNTING U. S. PRODUCTION of goods for export adds to competitive pressures in world markets. More goods will be available for overseas shipment later in 1952. Defense "stretchout" will allow the increase in

production of metals and chemicals to go into civilian goods, rather than to the military. Here is the outlook for some important metal products:

More automobiles: the industry will get enough copper and steel to turn out at least 1,050,000 units in the third quarter.

Auto parts supply is easing. Some exporters can fill 100% of all orders. U. S. exporters are running into stiff competition from Germany.

Electrical equipment is more readily available. Small motors are plentiful. But it still takes 5 months to get delivery on large motors.

Farm-machinery supplies are improving. Delivery of small tractors now takes only 3 to 4 months; crawler tractors are still on priority.

U. S. soft goods are more readily available than durable goods. There are some exceptions, notably certain chemicals. But most goods are plentiful, and supplies will increase through 1952.

Chemical prices are lower. Reason: increasing production both here and abroad. Items still in heavy demand, but with improved exports promised, include DDT, caustic soda, soda ash.

Penicillin supplies are good, and the price has fallen. Competition from Japan and other nations is cutting into U. S. markets abroad.

Plastics supplies are easing. Competition is a big factor. Dollar shortages are turning buyers from the U. S. to England and Germany.

SLOW SALES of consumers durable goods will not pick up much in 1952. That is what a survey taken by the Federal Reserve Board says. Survey shows that U. S. consumers plan to buy fewer durable goods this year.

Dealers in durables have been expecting a pickup in sales later this year. It may still come. But the FRB survey is evidence that cannot be overlooked. The survey has a phenomenal record of foreseeing postwar consumer buying patterns.

So exporters to the U. S. will have to work harder at selling—and cut prices in some cases—if they want to do business with the U. S. consumer. Consumers are showing that they know what they want in terms of price and quality. The days when consumers would snap up all the durable goods available are gone.

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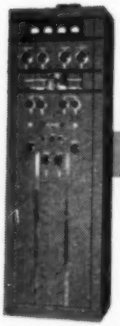

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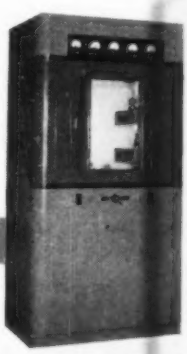

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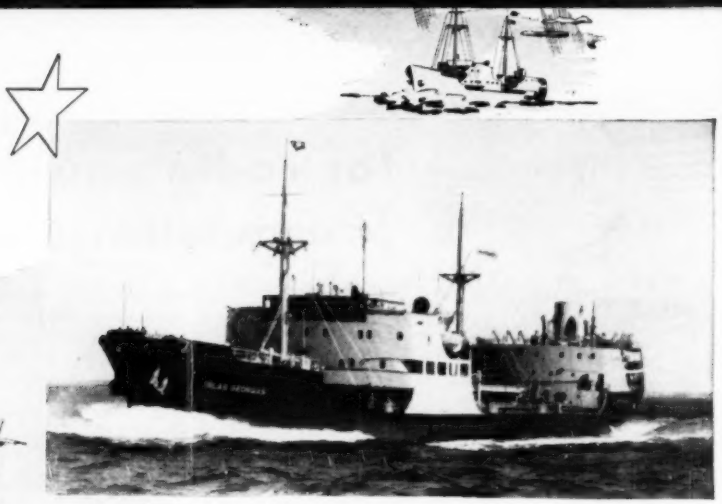

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Dealers in Principal Trading Areas Throughout the World

WASHINGTON REPORT

U. S. TRADE OFFICIALS expect a stabilization of world-trade volume at slightly lower than the present levels in 1952. Main factors pointing to trade stabilization are:

• **A new world shortage of foreign exchange.** Primary producing countries gambled on continuing inflation, plunged into the red on a buying spree last year. Worsening terms of trade and rearmament have emptied Western Europe's coffers. So there has been a general stampede to impose import restrictions.

• **Many Latin American and Asian markets** are now glutted with consumer goods. Importers, with their cash tied up in unsold, high-priced goods, are having trouble taking up newly landed cargoes.

• **World production of raw materials** has risen sharply since 1950. The increases amount to: synthetic rubber 75%, natural rubber 5%, zinc and copper 5%, steel 10%, electric power 12%, oil 15%. Most agricultural products are up sharply.

But Washington does not expect a major slump in world trade. Western rearmament will prop demand at roughly present levels for some time to come—despite the rearmament stretchout. U. S. purchases of tin, aluminum, natural rubber, and wool will rise slightly this year.

U. S. private inventories have been dwindling since December. Private buying of foreign raw materials will rise in the second half of 1952. But U. S. exports will drop some before they start picking up. Latest figures show they are down 25% to Latin America, 15% to Europe, 20% to Asia since year's end.

LONG-TERM PROSPECTS of world trade will depend largely on the evolution of the U. S. economy and trade policy. Even a slight recession here could paralyze the free-world economy. And success of the new protectionist offensive that is now underway in Washington would blight hope of expanding world trade.

Moscow's current efforts to tempt Western traders into Communist markets has put more urgency into the administration's fight to bloc new trade restrictions. Washington is particularly worried about the effects of new U. S. import curbs on Germany and Japan. Unless the free world can

offer those countries adequate markets, they will be forced to handcuff themselves economically to the Soviet chariot. And the U. S., as the world's largest creditor, calls the tune on world trading practices.

The administration is fighting protectionism on five fronts:

1. Opposing individual tariff increases requested under Section 7 of the Trade Agreements Act.

2. Favoring amendment of the section of the Defense Production Act that curbs dairy-products imports. The amendment would permit such restrictions only when essential to orderly liquidation of government stocks.

3. Still trying to push a customs-simplification bill through Congress. Chances are not good this election-year session.

4. Fighting to block the amendment to the Defense Production Act that would slash 50% off imports of products containing allocated materials.

5. Trying to find a legal way of bypassing "Buy American Legislation," which forbids government purchases of foreign products unless they are 20% cheaper than domestic counterparts.

Most serious immediate threat to foreign exports to this country is the recent flood of applications for additional tariff protection under Section 7 of the Trade Agreements Act. Sixteen applications include: Watches and parts, wood screws, chalk, plaster of paris, motorcycles, bicycles, chinaware, spring clothespins, dried figs, candied cherries, briar pipes, blue cheese, garlic, fish fillets, tuna and bonita in brine, bonita in oil. Machine-tool, textile, and sewing-machine makers are thinking of protection too.

BOLIVIA must wait for U. S. recognition. Paz Estenssoro's revolution was a blow to U. S. prestige in Latin America, a boost for Peron. Washington suspects that Juan Lechin, new pro-Communist Minister of Mines, was the real power behind the revolution, that Estenssoro was only a front man.

So Washington expects him to talk sweetly until a new tin contract is signed, then nationalize the mines, and adopt an anti-U. S. policy. But the U. S. will be forced to recognize the new government and start buying tin again in the next few months. Otherwise, Bolivians would start starving. That would earn the U. S. more hatred in Latin America than spanking the pro-Communist Bolivian government would be worth.

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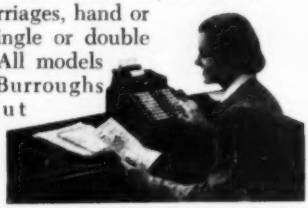
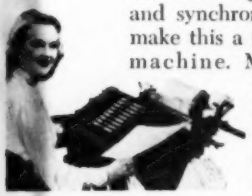
Adding—Subtracting—General Figuring—Styles from 7-column capacity to 13 columns, wide or narrow carriages, hand or electric, single or double registers. All models feature Burroughs Short-Cut keyboard.



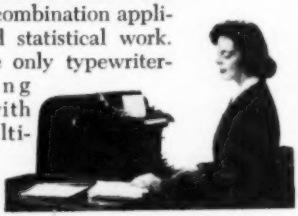
Accounting—Keyboard control of carriage, one-key totals and synchronized operations make this a truly high-speed machine. Multiple total models for banks, utilities, governmental and business applications.



Calculating—A complete range of styles. The Burroughs Electric Duplex Calculator with direct subtraction is the *only* calculator that remembers individual and grand totals.

Adding-Cash Registering Machine—Gives customers an itemized sales receipt... gives you a locked-in daily record. At the turn of a key it becomes a general figuring machine.

Billing and Statistical—For invoicing, combination applications and statistical work. This is the only typewriter-accounting machine with direct multiplication.



Burroughs Adding Machine Co.,
Detroit 32, Michigan, U.S.A.

Burroughs

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by any standard . . .

LINK-BELT REFINEMENTS

assure longer ball and roller bearing performance

Lubrication fitting with pressure relief feature prevents excessive grease pressure.

Spring-locking collar with set screws clamps bearing firmly on shaft.

Lubricant passes freely into large reservoir to lubricate bearing surfaces.

Self-aligning in all directions. Capacity for radial thrust loads.

Long inner ring distributes bearing load over large shaft area.

Self-aligning seals effectively keep grease in and dirt out, regardless of alignment. All aligning surfaces are protected by seals and fully lubricated — an exclusive Link-Belt feature.

Easily installed by slipping bearing onto shaft and clamping inner ring by tightening two set screws in locking collar.

Sturdy, compact, one-piece cast housing requires minimum support space.

Slotted bolt holes facilitate mounting on supporting structure.

Cutaway of Series 200 Ball Bearing Pillow Block —one of many types in the Link-Belt line of Pillow Blocks, Flanged, Flanged Cartridge, Cartridge, Hanger, Take-up Blocks and Unmounted Bearings.

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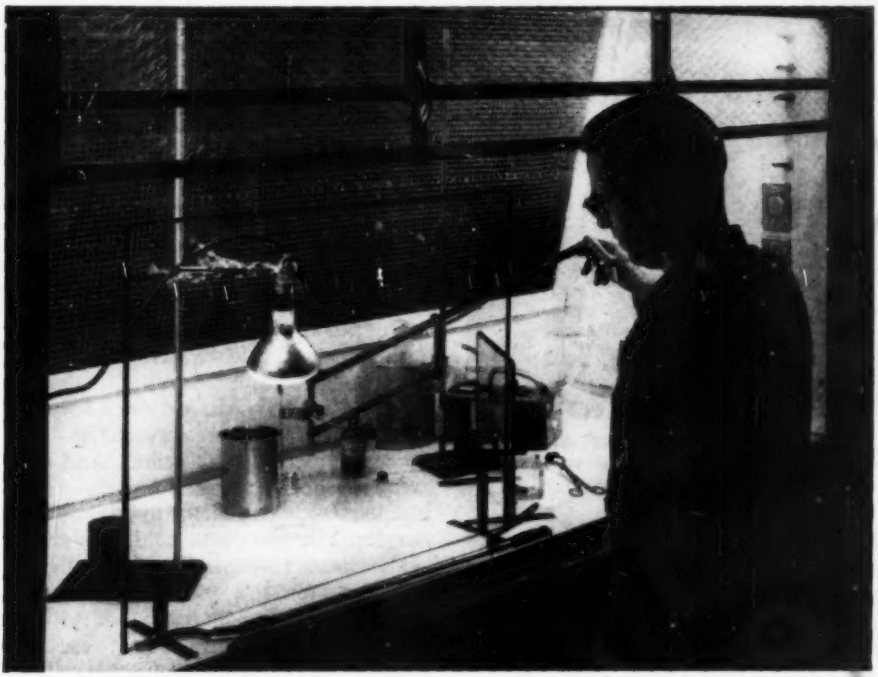


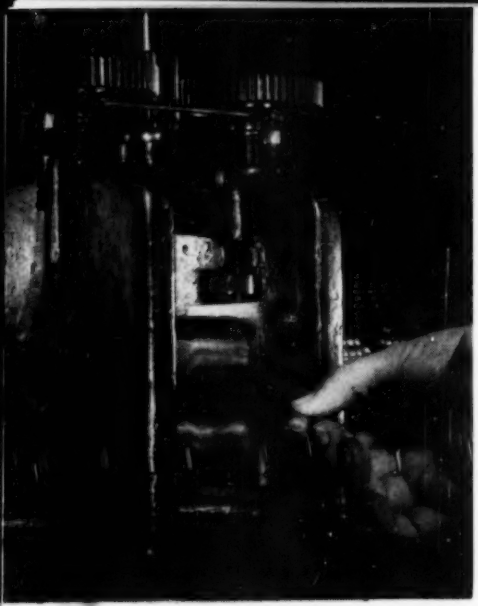
CHEMICAL-COMPOUND synthesis and other fields of research are studied with radioactive materials; here a Battelle scientist works with remote-handling equipment

Export Research for Hire

Battelle Memorial Institute, largest of American independent industrial research organizations, has now expanded its operations into Europe

THIS SPRING, research came to Europe from America. Not that Europe has had no research—the scientists of Europe, it is generally conceded, have done far more than those of the United States in advancing man's technical knowledge. This they have done by their many years of intense concentration on fundamental research.

But in both Europe and the United States, engineers and scientists recognize that American technicians have specialized in applying funda-



WATCH MAINSPRING that will not break is made from an alloy developed by Battelle—a high achievement in watchmaking

mental discoveries to industrial production with an effort and zeal and speed unmatched elsewhere. It is this specialized research that came to Europe this spring.

Battelle Memorial Institute, a name that in its 23 years of existence has grown famous, has established an international division with headquarters in Geneva. From this base, Battelle plans to expand its research and development program throughout Europe and to combine the best of American practice with the best of European practice for the benefit of European industry.

To understand what Battelle can do for Europe, let's see what it has done for the United States. Started as an endowed, non-profit corporation in 1929, it has grown from an original staff of 20 scientists to its present staff of 1,800. Chemists, physicists, engineers, mathematicians, geologists, agronomists, biologists, metallurgists, ceramists, and trained experts in almost every field of physical science are at work in its 42 research divisions spread over 12 acres of laboratories.

These highly trained researchers, working in teams, are busy developing new products, materials, and processes and solving technological problems. Last year, they were responsible for a $9-million research bill to American industry and government.

Battelle occupies a strategic position in American research. The large universities have their "ivory-tower" laboratories for pure research—research for research's sake. And the large corporations have their magnificient laboratories, primarily to develop the products and processes their companies need.

In between the university and the large corporation fit the research institutes like Battelle. To these institutes, smaller companies can turn for the research work they need—and larger companies, too, for research highly specialized and outside the field of their own research.

Serves as Private Lab

So Battelle's facilities are open to all companies, small and large. Battelle will tackle practically any research job, even those as tiny as the $615 project for one small company. Sponsoring companies pay for the work, Battelle furnishes plant and the brain power. In all cases, sponsoring companies retain complete rights to all developments. Thus,

Battelle actually serves as a private laboratory for any company with work there.

But Battelle will not accept all the projects offered. Its approach to a problem is strictly practical. A principle long adhered to has been that it would undertake no research project unless that project had a good chance of success. Industry liked this approach and showed its trust with the $50-million worth of sponsored research that Battelle has carried on.

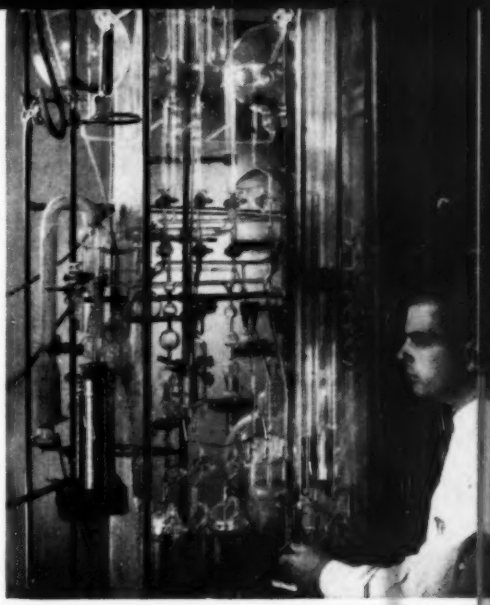
These Are Typical Jobs

These millions have paid for such a variety of benefits to American and foreign industry that only a sampling can be made:

• American industry must save nickel and chromium. So the Alloy Casting Institute sponsored research on developing a heat-resistant material of lower alloy content than that of the high-nickel alloys for 900° to 1400° F. service.

Beginning with an alloy containing 21% chromium and 9% nickel, fourteen different compositions within this range are being studied at Battelle to find which will offer best mechanical properties at high temperatures.

• A Swedish shipping firm recently reported its regular running time for its passenger boats between Denmark and Sweden had been cut by 30 min. The faster schedule was the result of coating the bottoms of the ships with a new paint that prevented formation of barnacles. Three and a half years of teamwork at Battelle went into the development of that anti-fouling paint. An added advantage—no docking needed to remove marine growth from the ship hulls.



***CATALYSTS** for use in the petroleum industry are being studied as to pore size and distribution in this maze of glass tubing*

• A big supplier of welding materials asked Battelle to help it develop a better method to weld aluminum. Four years of research resulted in a patented process that surrounds a consumable electrode with an atmosphere of inert gas—argon or helium. The process increases the speed of aluminum welding by five to ten times and now is applied also to welding common steel, stainless steel, aluminum bronze, and magnesium alloys.

• A manufacturer of steam valves wanted to prevent leakage at high pressures. Valves tight at 600 to 900 psi. leaked badly at 1,500 psi. Battelle researchers found that leakage in valve seats at extremely high pressures was caused by "growth" of tiny

leaks that occurred at lower pressures. Expanding steam at higher pressures through the leaks cooled the adjacent metal, causing it to contract and open up the leaks still further.

Battelle engineers developed a new valve-seat design, incorporating thin, flexible seating surfaces. The design cut down the cooling effect of the expanding steam and reduced leakage to one thousandth of the former leakage.

• A company making cloth-cutting machines was concerned about its sales. Battelle redesigned the machine to incorporate an automatic blade sharpener, improve appearance, reduce maintenance, and lower manufacturing cost. The machine now cuts even fluffy material.

• In agriculture too, Battelle has conducted many investigations both in the U. S. and in several foreign countries. Purpose: to increase and diversify farm production, to produce foods and feeds of higher quality, to expand and improve industrial utilization of farm and forest products.

The mechanical cotton picker, for example, saves time and money in the actual picking operation, but machine-picked cotton is dirty under some conditions. Research sponsored by the U. S. Department of Agriculture developed a cleaning process based on aerodynamics rather than mechanical principles.

• Other agricultural research at Battelle applied the heat-pump dehumidifier and fluidized-bed principle to crop drying; directed basic studies toward trace-element fertilization (as increasing tobacco crops by 30 to 35% through adding copper to regular fertilizers); found new uses for tall oil and upgraded sulfate turpentine into products of greater value, such as perfume odorants and an ore-flotation agent; salvaged some of the 65% of every cut tree that is commonly waste.

These few case studies show us how nearly every company can benefit from research. For without research, industry cannot grow. Research—the Battelle kind of research—is a necessity in this highly technological age to successful industrial operation.

As Western Europe continues to rebuild and rearm, Battelle hopes to help with its three-pronged program:

1. To establish research laboratories in Europe, staff them with European scientists and engineers for both European and American research projects, and exchange knowledge and experience between U. S. and European laboratories.

2. To help rebuild European scientific manpower by placing fellowships in various European universities for training in applied research.

3. To use already established laboratories in Europe (as the Fulmer Research Institute in England, TNO Council in Holland, and the Max Planck Gesellschaft in Germany) for research projects to be financed from Battelle funds or by sponsoring American and European companies.

To carry out this program, Battelle this year is betting $1½-million that industrial capacity in Europe has reached the stage where applied research can demonstrate its effectiveness and that Battelle has a place in the logical growth of European research.

Mexico Industrializes

Plans for steel expansion symbolize Mexico's drive to end dependence on its farms and bring self-sufficiency to nation

MEXICO has bet its future on an industrial revolution; in 10 years it has gone a long way toward that goal. Already, television sets (made in Mexico), skyscrapers, assembly lines, dams, and superhighways have changed the national character. The change is not just on surface either:

- Mexico's index of industrial production went up from 118 in 1950 to 130 in 1951. In 1940, the index stood at 74 (1947 equals 100). National income is about $5-billion, double the 1948 figure.
- Some 466 new industrial plants were set up in the Mexico City area alone last year.
- Mexico is the U. S. third-best customer—after Canada and Britain.
- Mexico has a balanced budget, absolutely no exchange controls to plague traders and foreign investors.
- Mexico is building from the ground up, spending hundreds of millions of dollars on rail and highway transport, power, irrigation, oil development.

First things first has been the rule for Mexico—reasonable sound finances, improved transport, more power, more iron and steel.

Finance—Mexico tries to pay as it goes; last year wound up with a healthy budget surplus. It has welcomed foreign investors. Best of all, there is complete freedom from exchange restrictions.

Transport—Ten years ago, Mex-

ico's railroads were in terrible shape; today, they are still far from adequate. But Mexicans are determined not to see their industrial program bog down for lack of transport facilities. Fully 42% of foreign loans have gone into transport and communications.

Power—Growth of new industry has placed a back-breaking load on Mexico's power resources. But Mexicans are hard at work on new facilities and hope to raise available power from the present 1-million kw. to 1.4-million kw. within a few years.

Oil—Proved reserves are 1.4-billion barrels; annual production is 78-million barrels. Mexico is piping natural gas to industry, and plans to link up with Texas transmission lines.

Coal and Iron—Mexicans think they have the coal and iron reserves to expand steel production. Coal resources are estimated at 2-billion tons; iron ore at 222-million tons.

Last year, Mexican trade ran a deficit of $150-million. Mexico is not worried about the gap. Besides a substantial gold and foreign exchange reserve, the booming tourist business makes up for the trade deficit. And Mexicans argue they are buying capital goods, not luxuries.

From its imports, from its home-made steel and power, Mexico gets the raw stuff for its growing manufacturing industry. Leading Mexican manufacturing industries—textiles, brewing, rubber, iron and steel, cement, glass, and footwear—are turning out about $600-million annually. In addition there are the large assembly operations from the U. S.—motor vehicles, radio and television sets. And important new industries keep coming into Mexico. —Business Wk, Apr 5, p133

World Business Briefs

▶ **Oil World:** Canada Southern Oils, Ltd., has come up with Saskatchewan's first important discovery of light oil. . . . There is talk of "gigantic" underwater oil deposits off the coast of Trinidad, B. W. I. Kern Trinidad Oilfields, Ltd., a British-U. S. outfit, says it will start offshore drilling soon. . . . Brazil's National Petroleum Council plans a small (2,000 bbl. daily) oil refinery 1,000 miles up the Amazon River at Manaus.

▶ **Israeli Industry:** An $8-million rayon plant—producing 10.5 tons of rayon yarn, rayon staple, tire yarn, and cellophane daily—is planned by U. S. and Israeli businessmen. Money is coming from U. S. investors, plus loans from the Export Bank of Japan and the Israel government. . . . Israel Electro Chemicals, Ltd., a new outfit backed by U. S., French, Swiss, and Israeli interests, plans a $2-million chlorine and caustic soda plant. Output will nearly fill Israel's needs. Daily output is slated to reach 5 tons of chlorine, 3.5 tons of caustic soda.

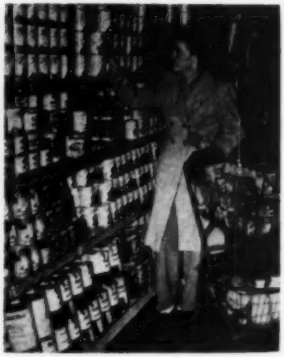
▶ **Brazilian Minerals:** Amapa territory has turned up another important mineral deposit. Preliminary exploration along the Amazon has located a bed of chromite ore. Meantime, construction of a 137-mile railroad linking the manganese area with the Amazon will begin soon.—Business Wk

FAMILY purchases this much cellophane-packaged goods in a single month

New Fields for Packaging

The container helps sell the contents in today's merchandising setup. So packaging men make every package a display piece

Please turn the page



1952 SUPERMARKETS with self-service principle make every package its own salesman

THE PACKAGE must be more than a container; it must help sell the product. That is a basic guide for the packaging industry. New materials, consumer testing, intensive package planning go a long way in making a product a success.

Cellophane was the first of the new materials uniquely suited to packaging. It is transparent, waterproof, can be heat sealed, and can take printing. Other materials—the true plastic films—have special qualities for certain applications.

One of these films is cellulose acetate. It resembles cellophane in appearance, texture, and clarity. It "breathes"—which means that many food products, particularly some types of fresh produce that require a continuing supply of oxygen to retain life or that pass off gases, can be held longer, taste better, and look fresher when packaged in acetate.

Pliofilm, produced by the Goodyear Tire & Rubber Co., has definitely changed packaging practices in the meat and cheese industries. Its remarkable "stretchability" has led to techniques of stretch-wrapping by which a small amount of the film can be applied as a tight sealed covering to cheeses and processed meats.

Another development is Cry-O-Rap, a shrink-type film developed by the Dewey & Almy Chemical Co. Cry-O-Rap's greatest virtue is its ability to shrink tightly, upon the application of heat, around an irregular object, excluding air and effecting almost a skin-tight vacuum-type package.

Ranking with the transparent films in importance as a packaging ma-

IDEAL supermarket package has quick identity, readership all around

***SARAN FILM** solves tough barrier problem in preserving coffee in bags*

***FOUR PACKAGING IDEAS** are window carton, cellophane wrap, tear tape, dispenser*

terial is aluminum foil. Water vapor cannot penetrate this material, and time and temperatures have no affect upon aluminum's protective properties.

These materials and others have been combined in an impressive array of new and better, more convenient, more protective, more economical package forms. Plastics first entered the packaging field on a mass-production basis in the form of molded closures for bottles and collapsible tubes. Molded plastics make possible the advantages of a new package form: permanent reuse features for the consumer and counter-display appeal for the dealer.

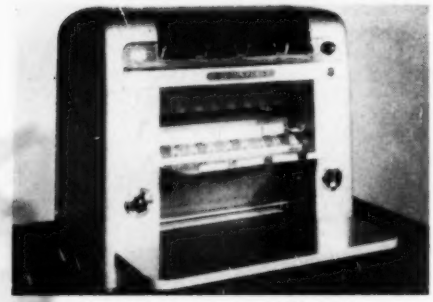
One package form that is not new, but has held its own against competition from other forms, is the glass container. Research has done much to lighten the weight of glass, yet retain its strength through tempering and the design of shapes to withstand high stresses and strains.

The unbreakable polyethylene bottle had its first commercial application as a non-corrosive container for laboratory chemicals. In the consumer field, the polyethylene squeeze bottle is an important package form and has appeared as a container for many products.

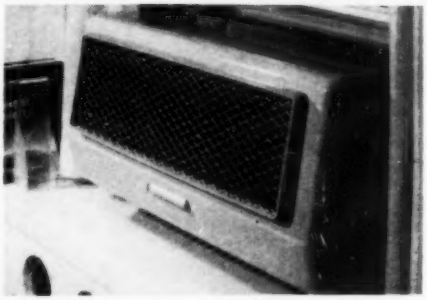
Supermarket selling techniques make it necessary for package designers to revise their standards. In these new stores, women can pick up and read the packages all the way around. So packages must have readership—just like a magazine, with effective pictures to hold interest and clinch the sale.—Mod Packaging, Mar, p99

***REPEATING BASIC DESIGN** elements assures consumer recognition*

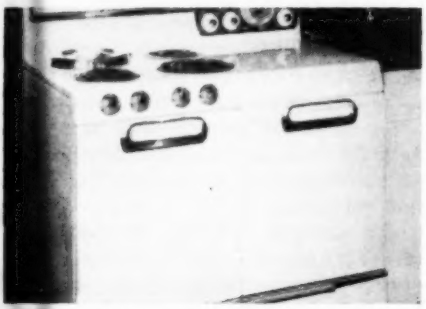
These Products Indicate Some of the Common . . .



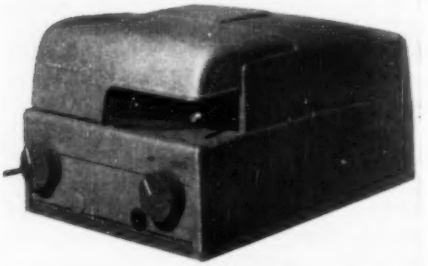
COPYING MACHINE has rounded lines suggested by outline of conveyor belt mechanism



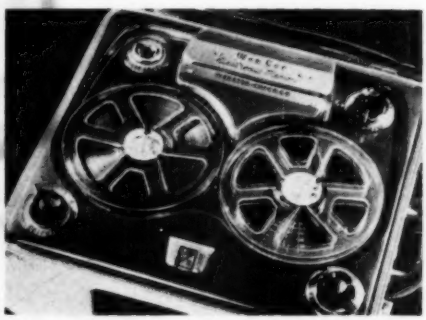
AIR CONDITIONER has been so styled as to reduce the apparent bulk of the machine



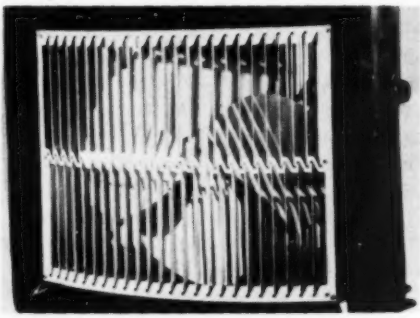
ELECTRIC RANGE is distinctive in shape of oven doors and location of door handles



DICTATING MACHINE has die-cast magnesium case emphasizing simplicity, small size



TAPE RECORDER recesses wheels into drawn steel top for protection, streamlining



CABINET FAN is made of plastic to cut tooling costs and finishing operations

Industrial-Design Objectives

Appearance design is not purely artistic because the sense of perspective and taste must be subject to practical restrictions

THE JOB of the industrial designer is to give a product the most pleasing appearance possible while working within the frame work of objectives set up by sales, engineering, and production.

Two main sales objectives are appeal to the prospective buyer and a better appearance than competitive products. To meet the first objective, the industrial designer compiles data on customer preference—on color, weight, size, and certain refinements and convenience features that are not essential to operation but do influence sales.

Then, a long, hard look at competitors' products helps make the new design distinctive. And possibly the designer may want to borrow some styling ideas—a big-selling product shows what customers want.

Next—Engineering, Production

Engineering of a product is ordinarily done before appearance design is begun. So the industrial designer then works within the restrictions set up, with the possibility, of course, of approaching the engineering department and negotiating for a change.

Production markedly affects the industrial design as the process, for instance, may limit the designer to stamped parts when he might have more freedom with die castings or injection-molded parts. Other production objectives asked of the industrial designer are: (1) ease of assembly, (2) a finish that can be applied in booths or tanks already available, (3) minimum number of parts, and (4) interchangeable parts.

These Are Good Styles

The copying machine was styled by Raymond Loewy for General Aniline & Film Corp. Contours were rounded for cleanliness, rigidity, and psychological appeal.

The General Electric room air conditioner, styled by Walter Dorwin Teague, looks smaller because surfaces exposed to room view were reduced in area and foreshortened.

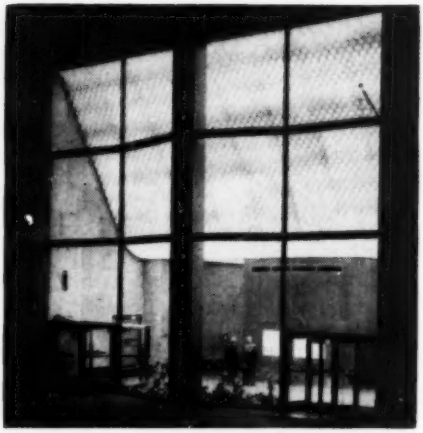
Another Loewy design, the General Motors Frigidaire range was styled to please women. The doors slope upward, and the handles extend above the tops of the doors.

Raymond Spilman styled the Soundscriber dictating machine. Three-piece case emphasizes simplicity, compactness, small size of the unit.

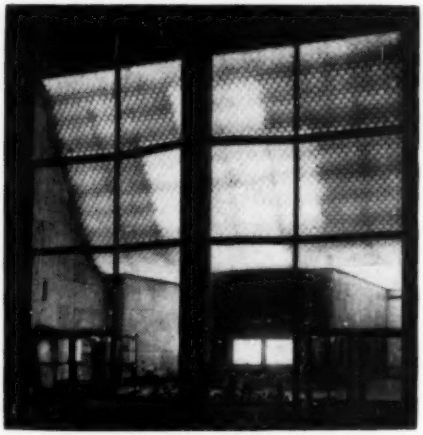
The Webster-Chicago tape recorder shows the restrictions the designer meets. Engineering specified a drawn case; the designers turned out a modern-looking unit.

Plastic was chosen for the cabinet fan of Chicago Electric Mfg. Co., both for economy and to reduce fan noises. Symmetry permits molding in a single-cavity die.—Prod Eng, Apr, p171

New Frontiers



NEW LOBBY uses three-story-high paneled glass front, behind which mobile color lighting gives dramatic effects.

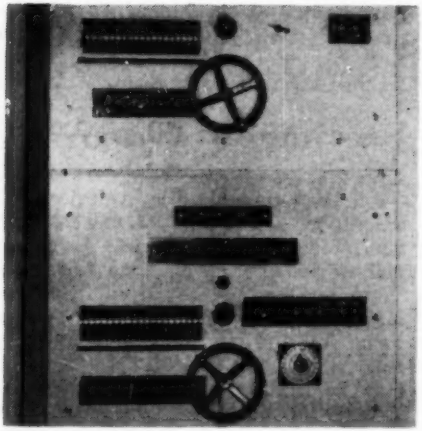


CROSS OF COLOR is just one of the many lighting effects available. Colors include red, blue, green, and white.

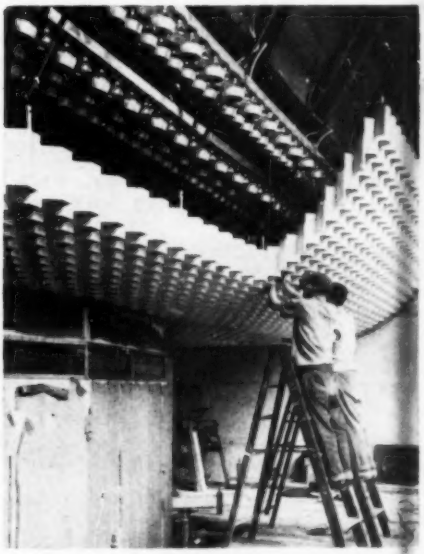
← **CELLULAR CEILING** curves downward from top of glass front to elevator lobby ceiling level of 15 ft. 6 in.

for Mobile Color Lighting

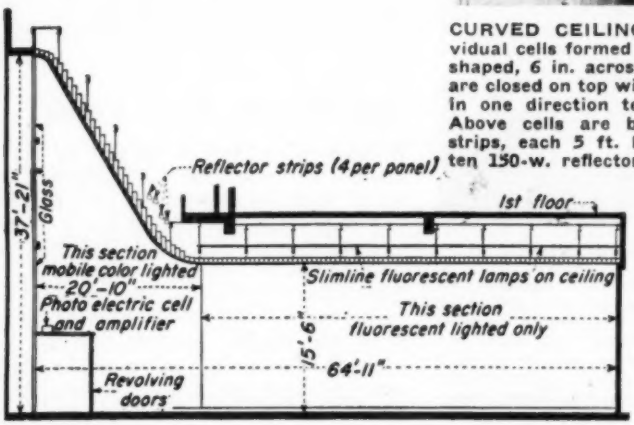
- ▶ Spectacular lighting identifies New York City office building
- ▶ System based on mobile color was invented by Rollo G. Williams
- ▶ Lobby lighting and ceiling cost $125,000—Elec C&M, Apr, p141



MASTER BRAIN of the system is two Rollocolor master controllers. Each controller provides constant or changing color pattern by operating potentiometers.



CURVED CEILING is made up of individual cells formed of aluminum, hexagonal shaped, 6 in. across, and 6 in. deep. Cells are closed on top with Plexiglas panels lined in one direction to give partial diffusion. Above cells are banks of reflector light strips, each 5 ft. long and equipped with ten 150-w. reflector lamps.



HERE'S HOW the lobby ceiling curves down and runs back flat, with cells and lights located as shown. Photocell over street door changes chromatic value of color lighting through master controllers.

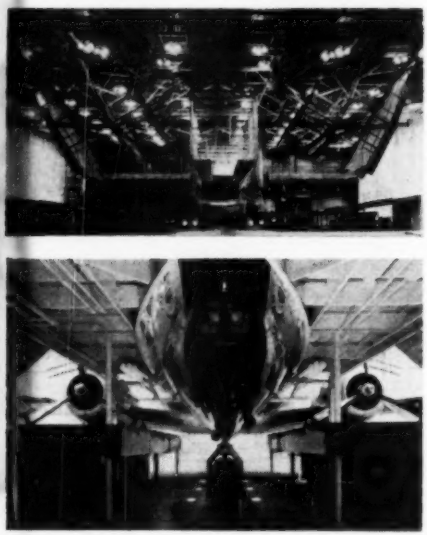
Mobile Bridge-Repair Units Effective in Highway Work

A truck-mounted machine shop, a crane truck, and a transport trailer truck do structural maintenance and emergency repairs over a large area for the Florida State Road Dept. Florida has found that the outfit pays off in maintaining its unusually large number of highway bridges. The work is done more economically than by former methods, and bridges are not as long out of service.

The mobile machine shop contains a lathe, drill press, hack saw, welder, compressor, and grinders. All equipment is housed in a van-type body having eight openings, each fitted with an overhead rolling door.

The crane truck will lift 2-ton loads and also has a 15,000-lb. winch. This unit has proved useful for setting piling and timbers.

Typical jobs include: maintenance of all steel superstructures, repair and replacement of machinery on movable spans, setting and welding of open-steel grid decks, and erecting Bailey bridges.—Rail Eng & Main, Mar, p279



DOCK SPEEDS MAINTENANCE

Maintenance framework for United Air Lines 4-engine Mainliners provides easy access to all sections of airliner needing maintenance. Craft is towed into place and framework (top) is lowered by operating a push button. Dock fits snugly against plane (bottom). Floor lighting eliminates shadows.—Aviation Wk, Mar 3, p47

New Synthetic Fiber—X-51

A new acrylic fiber—trademarked X-51—has been announced by American Cyanamid Co. The new off-white colored fiber, bluish-white in staple form and yellowish-white in filament form, has characteristics of easy dyeability, bulk in staple form, silkiness in filament form, stability, and resistance to chemicals and weathering. The fiber can also be produced in fine deniers, although the only sizes being produced at present are 1.5 and 3.0 in staple, and 75/45, 100/60, and 150/90 in continuous-filament form.

The new fiber is being produced in pilot-plant quantities only; no plans have yet been announced for commercial production.—Textile World, Mar, p123

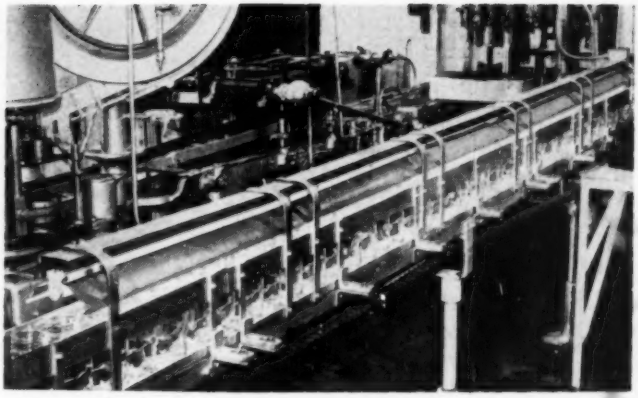
Rest Periods Show Value

Results of a recent survey of 1160 companies scattered throughout the U. S. seem to show that rest periods are about the best thing for a plant.

Reduction of fatigue is the biggest single benefit reported (by 82% of companies). Next is improvement in employee morale (75% claimed). And 62% say worker productivity has increased. Reduction in employee turnover is cited by 32%.—Factory, Mar, p135

KILL BACTERIA

Bactericidal lamps in syrup division of Anheuser Busch Co.'s New Orleans plant control bacteria in table syrup. They kill air-borne bacteria in empty jars and cans. Five 30-w. lamps are mounted 3 in. above tops of jars on conveyor belt. — Elec World, Mar 10, p137



European Machine Tools Capture Buyers' Interest

Foreign machine tools dominated the annual American Society of Tool Engineers exposition. One that attracted wide attention was Peter Wolter's two-plate rotary lapping machine. Both plates are power driven; the upper can be swung aside to allow lower one to be used as plain flat lap.

An unusual carbide grinder, also by Wolters, carries an optical micrometer to check nose radius. It has two concentric diamond wheels, one for roughing, the other for finishing.

The Sensitast lathe, by Heid of Vienna, has an electromagnetic tracer, inverted and oil-filled ways, leadscrew and rack inside the bed, and tailstock and steadyrest on a separate set of ways.

Pitler exhibited a vertical turret lathe on which turrets are replaced to change setup by loosening a single screw. Shown also was a Swiss-made Dixi horizontal jig borer on which all coordinate dimensions are set with large dials and adjusted with microscopes.

Other machines shown included the British Pultra micro lathe with 4-in. swing, the Italian Dimco vertical miller, the Weisser Hillbronn lathe featuring high spindle accuracy, and a Cri-Dan threading machine with French-made Mendon chuck having tiny air turbine to open and close jaws.—Am Mach, Mar 31, p133

Allows for Close Blending

At Brewster, Fla., American Cyanamid Co. recently replaced a system of bins with a stockpiling plant. Design of the new system places special emphasis on solution of many common stockpiling problems in handling phosphate rock:

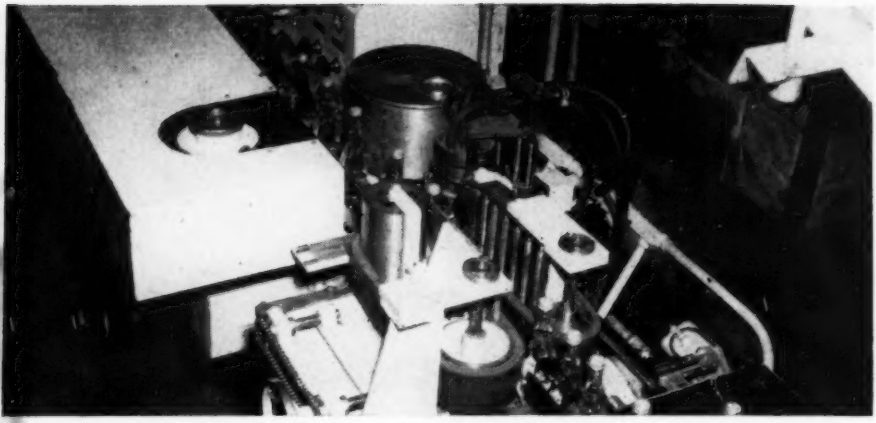
1. Materials handling is entirely by power.

2. Capacity is large, but the stockpile is effective with small tonnages.

3. The pile is readily adapted to either sorted or graded storage or a combination of both.

4. Blending control is easy to achieve.

Circular shape of the pile allows for continuous change in grade of pile—from low grade on one end to high grade on other. Four straight runs of tunnel under the pile allow draw from any point or points. Precise blending of feed is possible.—Eng & Min J, Apr, p110



COMPACT MACHINE labels containers at speeds and simplicity possible only with . . .

Thermoplastic Labels

Here is what users in the U. S. have found out about this type of label—no smears, fast operation, and savings in labor and space

FOUR YEARS of experience on labeling a wide variety of packages, without glue or water-soluble adhesive, has established these advantages for thermoplastic dry labels:

1. Firm adhesion and clean packages; labels do not curl and there is no glue to smear labels.

2. High-speed operation on rigid containers—300 glass jars or cans per min. —and rapid changeover of either label or container.

3. Low labor and maintenance cost and less floor space needed.

The adhesive layer may be either one of two general types, both non-tacky until activated by heat. One type loses most of its tackiness the instant the label is removed from the heating element; it is usually applied to flexible packages.

The other type of adhesive remains in a tacky state for several minutes. Labels with this adhesive are most suitable for high-speed machine labeling of all foods packed in cans, bottles, and jars.

In one U. S. food plant, where labels were applied by water-soluble adhesive to glass jars, four machines operated at 50 to 90 labels per min., depending on type of container. Since a changeover to thermoplastic labeling, one machine does all the labeling. Rate is from 260 to 300 labels per min. Labor cost is one-half, maintenance cost is one-quarter, capital investment is lower, power demand is reduced.

Machine operation is not complicated. Labels are sucked, one at a time, from their magazine by vacuum ports in a rotating drum and transferred to a rotating heating drum.

As the drum rotates, the label is

pressed against the container on one edge only. A conveyor carries the container to a pressure station. Here the container is rotated between a sponge-rubber-surfaced conveyor belt and a rubber pad to press the label firmly to the container.—Food Eng, Apr, p68

Radiant Heating Panels Cut House Building Costs

Installing radiant panel heating in a seven-room, two-bath house is cutting building costs by $1,800, according to the builder's estimates. Savings are made in eliminating basement and chimney.

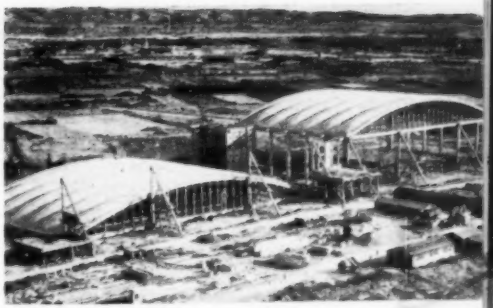
Each radiant ceiling panel consists of aluminum-covered phenolic high-pressure laminate sandwiching a copper-alloy wire element. The aluminum provides a ground. Panels are 17½ in. wide and in three lengths—46, 58, and 70 in. with ratings of 120, 150, and 180 watts.

Panels are attached by a plastic mastic in tape form on their back. Standard wiring channel fittings connect panel raceways to partitions where they are served by cable.

The panels are arranged symmetrically on the ceilings. As their maximum temperature is about 112° F., they are painted along with the ceilings.

Each house has 13.5 kw. for a volume of 8,300 cu. ft. Equipment and installation cost $1,500, about $700 more than an oil hot-air system, but eliminating basement and chimney saves $2,500.

Operation costs are higher than with common heating systems. But house buyers are welcoming the clean, dust-free system that requires no servicing, maintenance, or adjustments.—Elec World, Feb 25, p86



UNIQUE HANGERS FOR MARSEILLES

Corrugated concrete roofs are built on the ground and raised 63 ft. by jacks to the top of supporting columns in constructing hangers for Marseilles, France, airport. The roofs cover 3½ acres each and weigh 4,300 tons. Sixteen 300-ton jacks raised the roof at about 3 ft. a day. The roofs themselves consist of a series of concrete barrel arches in a thin-shell design. The design and construction method save steel and erection time.—Eng News-Rec, Mar 6, p50

Intercompany Com System

Union Oil Co. is finding its own communications system of high service in conducting its business. It is the largest integrated dual system (telephone and radio) in the petroleum industry and the first to adapt "carrier currents" to a dial-telephone system.

Carrier currents are obtained by incorporating low-frequency radio into wire circuits. For each pair of wires, three additional carrier circuits can be provided.

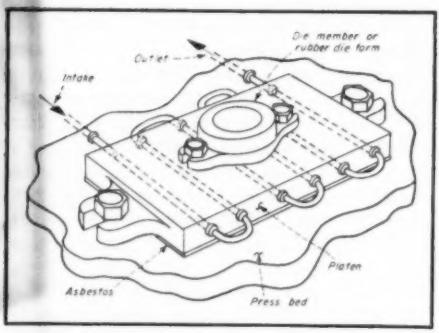
The system consists of 66 major circuits, 2,500 miles of voice channel, seven automatic exchanges, manual exchanges, and 1,150 telephones. Several automobiles and drilling locations are provided with two-way radio. Most of the operating personnel in a 300-mile long area are immediately accessible to one another.—Oil & Gas J, Feb 18, p93

TECHNICAL SHORTS

Finds Cracks—New French instrument detects cracks in thin wires from 0.8 to 32 mm. in dia. Wire is slipped into a solenoid, and high-frequency current passed through solenoid. Electrical characteristics of solenoid are shown on cathode-ray tube to indicate presence of crack.—Electronics, Apr, p226

Inside First—Building the inside of a building first is unusual but that is what Miller Brewing Co. did. The company needed insulated storage space fast, so it first put up the insulating wall, put the cold-storage rooms into use, and later erected the exterior masonry.—Food Eng, Apr, p127

Tests Fatigue—Most powerful fatigue tester ever built applies forces up to 500,000 lb. to test airplane parts. Developed by Lockheed Aircraft Corp., it uses a moving instead of a static reaction. Force is applied by hydraulic jack and unbalanced rotating weight.—Prod Eng, Apr, p209



HOT PLATEN FORMS MAGNESIUM

Consolidated Vultee Aircraft Corp. forms magnesium alloys on a hot platen by Guerin rubber process. Upper platen is rubber, which presses sheet metal to shape over form block. Lower platen is heated by gas, steam, or electricity to 300° to 400° F. so magnesium sheet will flow easily to shape.—Am Mach, Mar 17, p123

"Substitute" Stigma — Virginia-Carolina Chemical Co. wanted to keep its synthetic fiber, Vicara, from being applied as only a substitute for scarce wool and from possible replacement later as wool became available. So it now controls where Vicara can be used, will sell Vicara only if the product is approved by an independent research laboratory.—Chem Wk, Mar 1, p25

Tractor-dozer Peels Logs—Oversize plane attached to bottom of bulldozer blade removes bark from logs. Logs were placed in shallow trench, and tractor made successive passes with weight of blade resting on plane.—Const Meth & Equip, Apr, p166

Paper Tells Temperature—U. S. Army Quartermaster Corps has developed thermal indicators made of paper and capable of determining temperatures from 115° to 500° F. They consist of white pigment coatings on black paper. Each coating melts at a definite temperature.—Paper Ind, Mar, p1418

Absenteeism Rate High — Absenteeism costs U. S. employers about $56 per employee per year for every employee on the payroll, according to Benson Laboratories, Inc. Less than 25% of companies keep records on employee absences.—Am Business, Mar, p49

Cuts Noise—Shop-noise problem at J. Leukart Machine Co., Inc., was solved by vertically hanging special Fiberglas panels from the shop ceiling. Noise was cut 35%, productivity raised 7%.—Factory, Mar, p114

Lighting Handbook—Illuminating Engineering Society has completely revised the IES Lighting Handbook. It now covers 2,500 lighting subjects in 987 pages with 657 illustrations. The Society, at 1860 Broadway, New York 23, N. Y., is offering the book at $8.00.—Elec C&M, Mar, p208

Coal Gasification—Now under development at the University of Washington is a process to convert sub-standard coal to gas by a churning operation in fluidized beds of steam and oxygen. Unit, 36 in. in dia. and 14 ft. high, uses 100 lb. of finely ground coal per hour.—Chem Eng, Feb, p254

Aluminum Nickel-coated — United Aircraft Corp. and Bart Laboratories Co., Inc., have developed new process called Alni-Clad. Synthetic rubber compound is sprayed onto aluminum, dried, and plated with nickel. Hardness is 400-450 Vickers.—Am Mach, Mar 31, p67

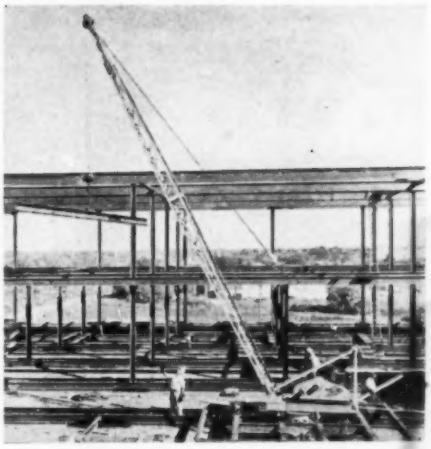
Wool Felting Resistance—Density with which wool is packed in a knitted fabric construction is a major contributor to resistance of wool to felting. Better launderability is obtained by an increase in number of loops per inch or in yarn size.—Textile World, Apr, p302

Checks Weld Quality—National Supply Co. uses a recording voltmeter to indicate quality of automatic welds. Deviation of voltage pattern from normal pattern shows when weld is inferior and should be X-rayed.—Weld Eng, Apr, p58

Cast-iron Chips Reclaimed — Novel method of reclaiming cast-iron chips injects them into the cupola just above melting zone. Equipment, made by Crofts (Engineers), Ltd., Bradford, England, consists of air-operated injector fed from vibratory hopper.—Mach, Apr 12, p561

How to Save Diamond Wheels—Carbide tips on cutting tools do not need ground-in chip breakers. Brazing a thin strip of carbide lengthwise on top of the tip makes a good chip breaker. Result: no grinding with diamond wheel.—Iron Age, Mar 20, p102

Amphibious Sulfur Mining—Instead of being a land-based plant, the Frasch injection plant of Freeport Sulphur Co. at Bay Ste. Elaine, La., will be mounted on a barge. Soft salt marshes in area prohibited erection of a permanent structure. —Eng & Min J, Apr, p128



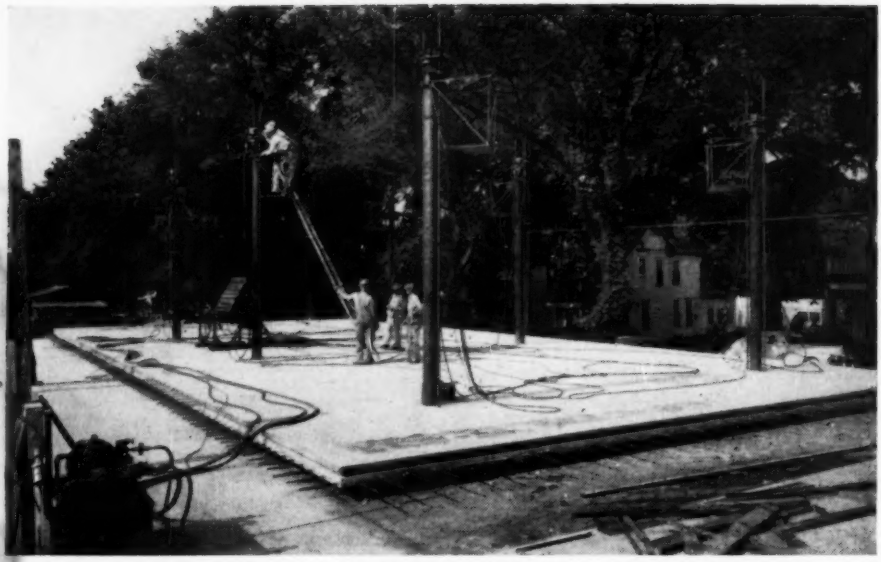
SETS STEEL OVER LIGHT FRAMING

With undercarriage replaced by traveling platform, Clyde Whirlette crane sets steel for two additional floors above light roof of plant. Platform rides runner beams blocked up on asphalt fills over existing column heads. Bar joists (in background) will span beams to support new floor above roof. Note wheels at top of platform for transverse transfer from bay to bay over temporary beams.—Const Meth & Equip, Mar, p54

Desert Challenger—Fiat four-wheel drive Campagnola with fully-loaded trailer was recently driven 9,500 mi. from Algiers to Cape Town, Africa, in 50 days. Only 6½ days were required to cross 2,360 mi. of Sahara Desert.—Auto Ind, Apr 1, p19

Depth Sounder as Fishing Aid—New echo-depth sounder, developed by Raytheon Mfg. Co., can be used as fish-finding device and navigational aid. It can detect schools of fish and determine their size and density.—Marine Eng, Apr, p122

Weed-free Yard—Appalachian Electric Power Co. covered yards and driveways with salt (50 lb. per 100 sq. ft.) and limestone chips. Material cost of 0.6 cents per sq. ft. gave 2 years of weed control. —Elec World, Feb 25, p98



JACKS in place at top of columns start to raise reinforced-concrete roof slab to final position

Jacks Lift Roof Slab

Lift-slab method erects building roof and saves contractor formwork, materials handling, steel and concrete labor costs

YOUTZ-SLICK lift-slab method was used by the Long Construction Co., Kansas City, Mo., to finish a building. Essentially, the method consists of erecting pipe columns; pouring the roof and intermediate floor slabs at ground level around column capital castings; then lifting the slabs into position by jacks on top of the columns operating through jacking rods engaging the castings. When slabs are in place, the castings are welded to the columns.

First step in constructing the one-story building was erection of the pipe columns. Next a reinforced concrete floor slab was poured over the entire building area. After a trowel finish, a separating medium was sprayed on the slab.

Steel casting lifting collars that served as column capitals in the flat-slab design were lowered over the columns to the floor slab. These castings accommodate jacking rods, which terminated in threaded sleeves at the bottom of casting holes.

Then reinforcing for the roof slab was placed and tied into the castings, and the slab was poured. Only formwork required was simple edge boards.

A special hydraulic jack assembly with a 3-in. lift was set on top of each column. These assemblies carried two yokes, the lower one stationary, the

upper one doing the lifting. Through these yokes were run two 1¼-in. threaded jacking rods, fastened to the sleeves at bottom of the slab casting.

Above each yoke on each rod was a heavy nut, automatically kept turned down tight against the yoke by a low-powered hydraulic motor. Thus, during a lift, the nuts on the lower yoke acted as a safety measure against hydraulic failure and also held the load while the jack was being retracted for a new 3-in. lift. Likewise, the top nuts followed the top yoke downward as the jack was retracted, always ready for a new lift.

Control of jacking operations was through a central station that rode up with the slab. Indicators on this control board showed the progress of each jack; as jacks could be controlled separately, it was easy to keep the slab level.

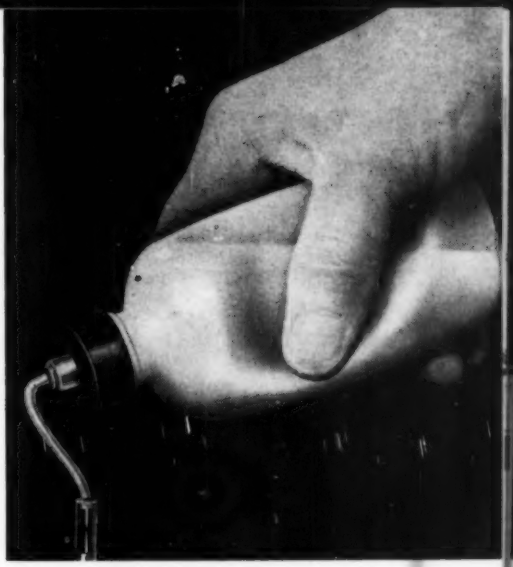
Upon completion of a lift, the lifting castings were welded to the column and the job was complete. Total time for a 15-ft. lift was 5 hr.—Const Meth & Equip, Apr, p50

New Spinning Frame Has Many Advantages

Saco-Lowell Shops' new Gwaltney spinning frame—the SG-1—combines a notable advance in larger-package spinning techniques with a notable advance in machine design.

The frame can produce a yarn package holding up to 1 lb. of yarn. This larger package greatly lengthens the doffing cycle, reduces winding costs and knots, and increases the practicability of rewound filling. In spite of the larger package size, conventional spindle speeds can be run.

The new frame permits spinning of larger packages by controlling the balloon size through use of three anti-node rings between the front roll and the bobbin. Tension variation is reduced.



DISPENSES MERCURY

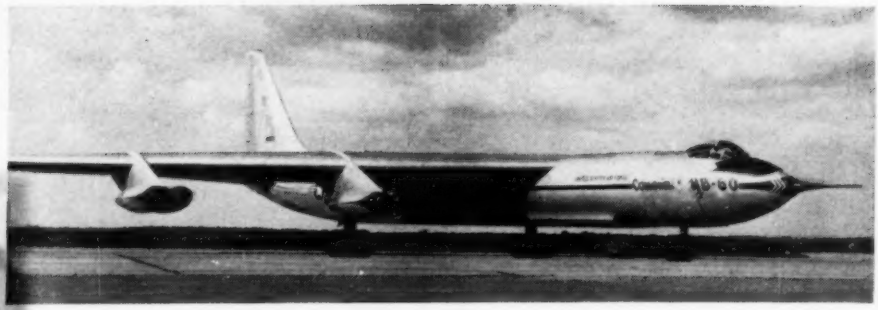
Polyethylene squeeze bottle accurately delivers mercury to manometers, thermometers, meters, and mercury gages of all types. Bethlehem Apparatus Co. packages the mercury in a 5-lb. bottle. Mercury cannot be exposed to contamination, and transfer containers are eliminated.—Mod Packaging Feb, p105

The design practically eliminates cleaning by the spinner and makes possible increased machine assignments. Antifriction bearings reduce lubrication frequency to once every 6 months.—Textile World, Apr, p120

Aids Foundation Work

New bore-hole camera for solving foundation problems of concrete structures has been developed by Engineering Research Associates. It will help discover flaws in all types of bedrock.

Camera can take 360° photographs of a 3-in. dia. bore-hole. A matching projector shows an undistorted picture on a cylindrical screen. Film used is regular 16 mm. motion picture film.—Eng News-Rec, Mar, p90



PUBLIC GETS FIRST LOOK AT 8-JET YB-60

U. S. Air Force recently released this carefully posed photograph of the Consolidated Vultee 8-jet YB-60. Picture shows swept-wing design progression from B-36 to B-60. Landing gear system is same as B-36. The YB-60 has same fuselage as the B-36 with some modification to the nose section making it possible to adapt B-36 manufacturing tooling in these panels and landing gear—Aviation Wk, Apr 14, p14

Oil-Refining Trends Point to More Petroleum Coking

Oil-industry attention at 40th annual meeting of Western Petroleum Refiners Association focused on these trends in refining:

• **Product demand**, expected to run 6% instead of present 8 to 10% above 1951 volume, calls for further reductions in crude runs to stills; such operations have leveled off recently.

• **Petroleum coking** as a means of increasing light distillate yields at the expense of residual production will be more prominent. Reasons are major demand for gasoline and distillate fuels and limited supply of crude oil.

• **Economic success** of any catalytic reforming process may be determined by the catalyst employed. Thus, for the Atlantic Refining Co. catalytic reforming process, yields of ethane and methane are below 1% and purity of recycle stream is 95 mol. % hydrogen on pilot-plant runs.

• **Houdriforming** was pointed out as a processing tool for (1) upgrading low-octane naptha for incorporation in motor fuels, (2) practically complete desulfurization and octane improvement of high-sulfur stocks, and (3) processing of selected cuts for aromatics and gasoline blending stocks.—Oil & Gas J, Apr 7, p82

Produce Plus Seasoning

Prepackaging produce for the housewife has taken a new twist. Suffolk Farms, Revere, Mass., packs a dry powder seasoning in its spinach bag and French dressing with its salad mix.

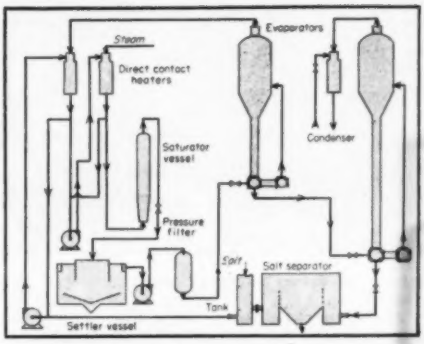
A cellophane bag gives excellent visibility to the spinach. Inside the cellophane bag along with the spinach is a smaller polyethylene-coated paper envelope. Inside this envelope is the seasoning.

The fresh-pack salad mix is also bagged in cellophane. The French-dressing pouch is made of liquid-tight Pliofilm-cellophane lamination.

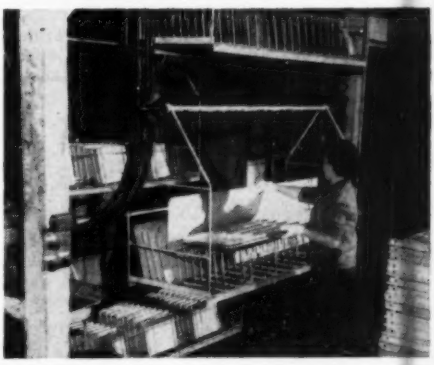
In both the spinach and salad packs, the smaller pouches are arranged for quick identification and brand recognition.—Mod Packaging, Feb, p86

This Month's How To . . .

. . . **refine salt** with low power cost, high product control, and no scaling problems is answered by International Salt Co.'s new process now in pilot-plant operation. Mixture of solid salt and brine is heated by steam to dissolve salt. Heated brine approaches saturation in saturator vessel, insolubles are settled and filtered out, and hot brine is fed to evaporators where it flashes cool on mixing with evaporator brine. Salt crystallizes and is separated from brine in salt separator. The process is continuous.—Chem Eng, Mar, p140

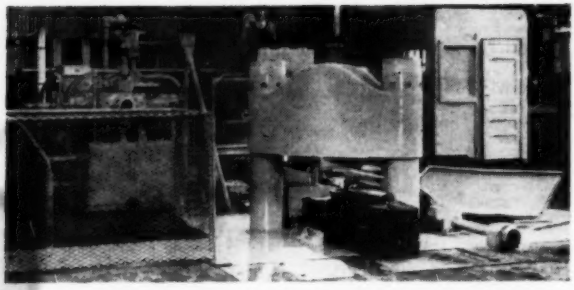


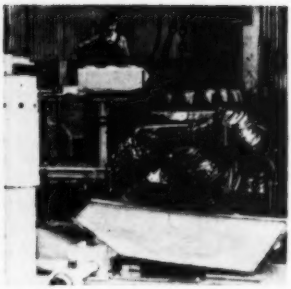
. . . **treat aluminum panels** is shown here at the start of the treating line for General Electric refrigerator evaporator units. Panels are etched in new caustic etching compound, Diversey Aluminux, made by Diversey Corp. Use of compound has eliminated frequent line shutdown for removal of alumina sludge and scale from tanks. Agent in compound prevents sludge formation by holding sodium aluminate in solution. Compound is 90% caustic. General Electric recharges solution every 4 weeks. One man can clean the tank in 1 hr.—Iron Age, Apr 3, p138



. . . **find soil moisture and density** in the field is a fast job with a gamma-ray device. Under test by U. S. Civil Aeronautics Administration, the apparatus has a radioactive source. A radioactive probe is inserted into the soil. Gamma rays bombard the soil surrounding the probe. The number of rays returning gives a measure of the soil density. For moisture content a different setup is used. It depends on the ability of hydrogen atoms in the water to absorb the energy from the neutrons that are emitted from the probe.—Eng News-Rec, Mar 27, p72

Scrap Baler Speeds Scrap Recovery





Return of scrap to steel producers will be speeded up by a new scrap baler designed by the Hydraulic Press Mfg. Co. The new unit, powered by hydraulic rams, compacts up to half a ton of medium-gage sheet steel into dense cubes 18 in. on a side. Density ranges from 45 to 70%. Operation of the baler is completely automatic once loose scrap is fed into the loading hopper. The hopper then drops its charge into the baler box beneath the plant-floor level. In the baler box, three hydraulic rams work on all six sides of the scrap cube. The result, a compact steel bale, is automatically discharged at floor level by a fourth ram 3 min. later.—Factory, Mar, p150

New Polyester Film Has Bright Electrical Future

Mylar polyester film, the newest result of Du Pont's research and still in experimental production, is a condensation polymer of terephthalic acid and ethylene glycol. It is a film and has no textile applications.

Mylar's physical properties point its use in another direction. It combines a 25,000-psi. tensile strength with a dielectric strength of 4,000 to 5,000 volts per mil. Flexibility, mechanical strength, and electric stability are good from —50° to 150° C.

Moisture does not affect it. And it is resistant to attack by oils, varnishes, and chemicals, but not phenolic solvents.

All this adds to a promising future in the electrical industry. Mylar offers space saving as a capacitor dielectric. Its moisture resistance, as insulation, could lead to simpler design and assembly of motors and generators. Also, it is well suited for use in high-speed taping machines and promises savings in production time and cost in coil winding and wire wrapping.

Other possible uses: film-based industrial tape, packaging, laminations, collapsible tubing storm windows.—Chem. Wk, Feb. 16, p31

Materials-Hoist Intercom

Two-way intercommunication system speeded construction of a 26-story apartment building in Chicago. Installed on the materials hoist, it permitted men on the hoist to give vocal instructions, instead of gong signals, to the hoist engineer on the ground level. Result: faster, safer operation.

A trolley-wire system was installed to make electrical connection between the two intercom units. Two copper wires were strung vertically from ground to the top member of the hoist frame. Collector wheels were mounted on top the hoist cab to make contact with the wires.—Elec C&M, Mar, p122

Electronic Recording Unit Measures Fly-Ash Emission

Electronic fly-ash recorder, developed in Australia, measures dust output from boilers. A 6-in.-dia. sampling tube is fitted across the induced draft fan. Ports in the tube admit air because of a negative pressure in the tube.

A phototube setup permits detection of fly ash. A pulsating direct current flows in the cathode resistor of the tube. Frequency of the alternating-current component depends on number of shadows per second affecting the cell because of light absorbed by dust particles. The alternating-current component is amplified and applied to a direct-reading frequency meter.

The meter does not show the absolute number of particles. Instead, it indicates trends in the quantity of ash passing out the stack. The minimum size of particle counted is governed by setting of the gain control.

The instrument does not ignore slow ambient light-intensity changes. Nor is the reading affected by slight fogging of the phototube by dust.—Electronics, Mar, p154

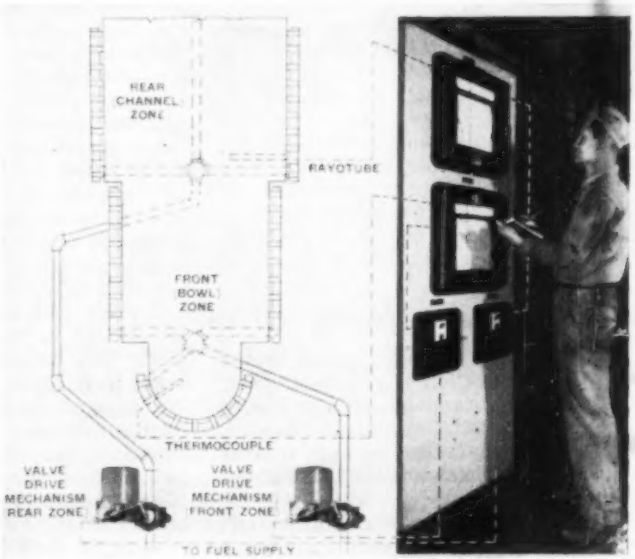
New Coal Briquettes Made

Sulfite waste from papermaking is now going into a fuel suitable for furnaces, space heaters, fireplaces. The fuel is made by running fine coal, along with concentrated sulfite liquor, through concrete-block machinery. The sulfite liquor acts as a binder and is itself an excellent fuel.

The fuel briquettes are the size of common brick. They are practically dustless, produce little or no smoke, and have a heating value 25% greater than does ordinary coal. The research was sponsored by the Sulphite Pulp Manufacturers' Research League.—Paper Ind, Feb, p1283

CONTROLS RAISE BOTTLE OUTPUT

Too much glass per bottle adds to the cost. So fluid glass temperature should be controlled closely as small temperature variations can change weight of glass in each mold of automatic molding machines. This Leeds & Northrup control regulates feeder temperature at Brockway Glass Co. within fraction of 1°. Rayotube and thermocouple check temperatures of glass in channel and bowl of double gob feeder. Results: machine speed up 4%, bottle output up 2 gross per hr.—Ceramic Ind, Mar, p70



Vapor Deposits Dense Coatings

Excellent coatings of metals, alloys, and even nonmetals can be deposited on one another by chemical reaction at heated surface

VAPOR DEPOSITION has proved to be a versatile technique for applying coatings. The method is not new. Fifty years ago, vapor deposition was tried by investigators seeking a method to form tungsten filaments for incandescent lamps.

The technique, neglected for many years, now shows itself to be useful in forming a wide variety of metallic and refractory coatings—tantalum, chromium, titanium, molybdenum, tungsten, carbides, borides, nitrides, silicides, oxides.

Vapor deposition is best described as formation of a coating by chemical reaction at a heated surface. Most processes are carried out at atmospheric pressure, but operating at reduced pressure may be preferred in many cases.

The coating procedure is substantially the same. Plating atmosphere is forced past the heated body to be plated. Although the coatings are deposited at temperatures below their melting points, they are dense and have the same properties as fused metals.

A carrier gas may be employed. It may be inert, as the helium used to transport metal carbonyls, or reactive, as the hydrogen that acts as a carrier in halide reductions.

How To Heat for Plating

The article to be plated is best heated internally, induction or resistance heating being most common. It also can be externally heated, but plating efficiency is then frequently low because coating material is deposited on the walls of the plating chamber.

Metals, except osmium, ruthenium, and iridium, can be deposited in ductile form. They can be made hard and brittle by adding carbon, oxygen, nitrogen or hydrogen compounds to the plating atmosphere.

Of the factors that influence the nature of the deposit, body temperature seems to be the most important. Lower temperatures give finer crystalline deposits.

Temperature and Pressure

Body temperature also affects the adhesion and cohesion of the deposit. Less stable plating compounds tend to be reduced or decomposed before they reach the heated surface.

Pressure of the reactants in the plating atmosphere also affects the crystallinity of the deposit. The lower the pressure the coarser is the deposit. Coatings made at atmospheric pressure are usually microcrystalline.

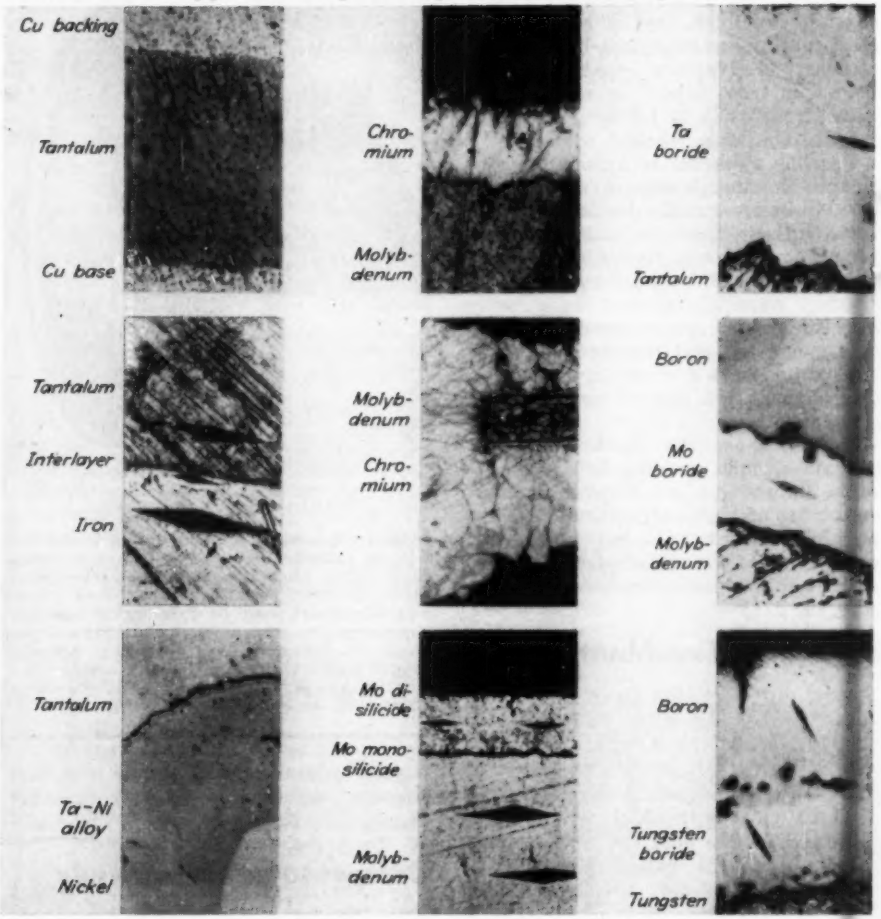
Deposit purity depends on the purity of the starting materials and on the plating conditions. Temperatures and pressures should be chosen so the body temperature is above the melting point of the metal component of the coating.

Deposition rates vary with materials deposited and process used. Thickness may be varied over a wide range; average deposit is 0.0001 to 0.0005 in.

A wide variety of products and materials can be coated by vapor deposition. The metals and refractories already mentioned plus many more can be deposited successfully by one or more of the following: copper, nickel, iron, tantalum, molybdenum, graphite, porcelain, quartz, alumina, pyrex, and carbide compounds. Metals can be coated on nonmetals, and vice versa.

Articles that have been coated by

These Are Typical Vapor-Deposited Coatings



From top to bottom in columns—first column: Tantalum deposited on 0.072-in. dia. oxygen-free high-conductivity copper wire, 15 min. at 900° C. (666 X magnification). Tantalum on high-purity iron, 30 min. at 1000° C. (187 X). Tantalum on nickel, 1300° C. (562 X); intermediate layer is tantalum-nickel alloy. Second column: Chromized molybdenum (pack method), 6 hr. at 1000° C. (375 X). Chromium on molybdenum, di-iodide decomposition in vacuum, 1 hr. at 1000° C. Siliconized molybdenum, 1 hr. at 1200° C. (150 X); molybdenum disilicide and molybdenum monosilicide form on the molybdenum underbody. Third column: Tantalum boride on tatalum, 15 min. at 2000° C. (375 X). Boron on molybdenum, 15 min. at 1000° C. (375 X); intermediate layer is molybdenum boride. Boron on tungsten, 15 min. at 1500° C. (375 X); again, intermediate layer is a boride of plating material and underbody.

vapor deposition include wire, rod, tubing, strip, pyrometer wells, die blocks, nozzles, crucibles, and X-ray targets. Most coating has been done by the batch process. Refractory metals can be coated on iron, copper or molybdenum wires from 0.125 to 1.5 mm. in dia. by a continuous-flow method.

Possible applications are many: combustion-chamber linings, exhaust-chamber linings, turbine-blade coatings, valve linings, heat-exchanger and regenerator elements, fuel-injector nozzle linings, shotblasting-nozzle linings.

Other possible uses include vacuum-tube elements; transparent, aspheric lens elements; and nitride and boride superconductors for use in heat-sensitive elements of measuring or control instruments.

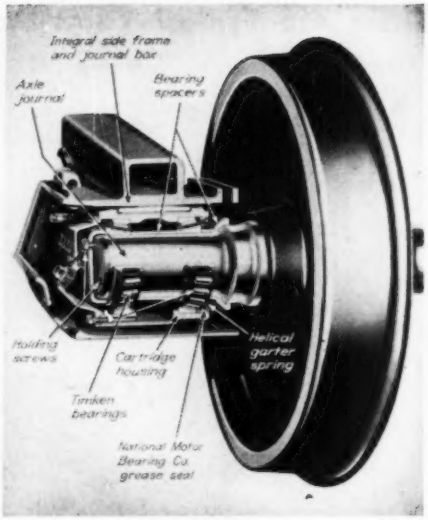
Large, transparent blocks or crystals of oxides, such as SiO_2, ZrO_2, MgO, or Al_2O_3, might be produced. Massive quantities of hard refractory or highly-pure materials may be made. Another application of wide interest is corrosion-resistant chemical ware.—Iron Age, Apr 10, p113

Dip Bans Two-Month Rust

Special dip at Boston Gear Works prevents gears and similar products from rusting for up to 2 months in 95% humidity weather. Parts are degreased in a solution of caustic soda and sodium nitrate, rinsed in cold water, then dipped in a 2% solution of a volatile nitrate chemical called VPI by its maker, Shell Oil Co. (McG-H Digest, Oct '52, p58)

The cold-water rinse is necessary because soluble cutting oils precipitate VPI crystals and cause the inhibitor to irritate the skin. Apparently, the reaction between remaining caustic soda and the emulsifying sulfonate causes the irritation because the nitrite itself is not irritating.

Parts, after dipping, are stored in covered containers to exclude dust and prevent undue loss of vapors.—Am Mach, Feb 18, p142



FREIGHT-CAR BEARING

Interchangeable roller-bearing cartridge for use on railroad freight-car trucks replaces plain brass journal bearings. Cartridge is steel cylinder holding two tapered roller bearings positioned on journal by spacers. Assembly fits three truck-side frame designs in common use. Bearing permits longer trains because of lower starting friction. Maker is Timken Roller Bearing Co.—Prod Eng, Mar, p152

Compensates for Altitude

An altitude corrector has been produced by the Solex Carburetor Co., England, for attachment to Solex carburetors. It is being fitted to automobiles intended for export to mountainous countries.

The device is screwed into the carburetor body in place of the main jet carrier. The normal setting cuts the fuel 25%.—Auto Ind, Apr 15, p53

Modern Resistance Welders

Three-phase rectifier-type resistance welding machines provide direct current for spot and seam welding of aircraft structures

EFFICIENT EQUIPMENT for spot and seamwelding at Consolidated Vultee Aircraft Corp. consists of a battery of ten new direct-current three-phase machines with rectifier accessories. This type of welder was chosen to balance the load on substations and feeders and also for a better power factor—about 95%.

The machines, all with deep throats, weld both 18-8 stainless steel and 24ST aluminum alloy. Stainless-steel parts from 0.008 to 0.235 in. and aluminum alloy parts from 0.016 to 0.0188 in. can be welded.

Welders are supplied with refrigerated circulating water. The system will save 125 gal. of water per min. and also reduce tip pickup and redressing.

Weld current is fed into a magnesium and copper sulfide, dry-disk, three-phase rectifier on the secondary side of the welding transformer. Eight-tap selector switches, one for each 50-kva. transformer, regulate the temperatures.

Sequence controls for each machine regulate squeeze, hold, weld, forge-delay, postheat, chill, temper and off times. Weld time is controlled through increments of 1 cycle from 0.019 to 9.728 sec. by toggle switches and series resistors in a time-delay circuit.

Dual pressure is provided by two air cylinders of different sizes, the smaller one acting against the larger. When squeeze time starts, both cylinders are filled so the net pressure is the difference. At the end of the forge-delay period, the smaller cylinder is dumped and the electrode force is raised to full amount developed by the larger cylinder. Dual pressure is considered most essential in welding aluminum alloys.

Weld current for the transformer primaries is controlled by an ignitron contactor, fired in turn by thyratron tubes. Each contactor consists of two ignitrons connected in inverse parallel so each tube relays half the 60-cycle wave.

This condition enables the contactor to control two phases of the three-phase line. The third phase is fed directly to the transformer primary. The thyratrons are fired as required by the sequence controls to assure synchronous control of weld current and the primary current wave.

When aluminum alloys are welded, the normal weld sequence is varied to

***WELDER CONTROLS** include sequencing on top panel; weld, postheat and temper times on center panel; phase-shift heat on lower panel*

avoid defective welds. Forge pressure is applied at about the same time that the weld current begins to flow. This prevents spitting of molten metal without lowering contact resistance or using too much current.

At the end of the weld period, the weld is postheated to eliminate internal stresses or cracks. Postheating prevents too rapid cooling because of the high thermal conductivity of the aluminum alloy.—Weld Eng, Apr, p32

Molded Plastic 'O' Rings

One of the smallest molded polyethylene applications reported to date is an "O" ring produced by Grebar, Inc., for use in military time fuses. Each ring, which is injection molded in the shape of a tiny doughnut, weighs 0.0205 grams. Its inside diameter is 0.055 in. Outside diameter is 0.179 in. Thickness is 0.062 in.

Forty rings are produced at one time in a 40-cavity mold run on a 4-oz. injection machine. Polyethylene flows into each cavity through a small gate. The operator breaks the pieces from the gates; a trimming die was impractical. —Mod Plastics, Apr, p165

Converts Waste to Vanillin

A $1.3-million plant will produce vanillin this year from waste sulfite liquor. Ontario Paper Co., Ltd., developed the process.

Lime added to the sulfite liquor forms lignosulfonate. The liquid and sludge are agitated, and air is bubbled through the mixture. After oxidation, most of the calcium vanillate is present in the liquid phase, which is separated from the sludge and acidified with carbon dioxide to get the vanillin.

Initial plant capacity will be 400,000 lb. a year. Other products will include vanillic acid and acetovanillone.—Chem Eng, Feb, p103

FORK OPENINGS IN UNIT LOAD

A unit-load bundle with space allowed for truck forks has cut the cost of handling shooks (box parts) for National Lock Co. National has its boxmaker make up the loads with small openings near the bottoms (arrows). The unit load cuts freight costs and increases storage capacity, besides saving the costs of pallets and pallet return.—Factory, Mar, p108

Fresh Water From Sea Water

Cheap, continuous process to make fresh water from salt or brackish water is reported by Ionics, Inc. The job is done by Perionic membranes, which are continuous sheets of an ion-exchange material having an electric current passing through them.

A stream of water sent through the membrane emerges from the other side as two streams. One is fresh water with two-thirds the volume of the original stream; the other is a highly concentrated brine, which can be treated to extract salt or magnesium.

Cost estimate per 1,000 gal. of sea water would be 15 cents with power costing 0.3 cent per kw.-hr. This cost is about half of just the power costs for a vapor compression evaporator. Membranes require no regeneration and are usable for long periods of time. Tests are underway to determine effective life.—Chem Wk, Mar 8, p36

Diesel Drives Roller through Torque Converter

No gear shifting, no jerky stops and starts, no pressure ridges and waves in the blacktop finish—just smooth, easy performance backed up by the lugging power of a diesel engine. That is the story of the new pavement rollers equipped with General Motors diesel engines and Twin Disc torque converters.

Operation is simple. Two levers control speed and direction. Change of direction is smooth and easy. When reversing, the roller does not sit still an appreciable length of time. The old clutch and gear-shift roller stayed in one spot while the gears were shifted long enough to leave a dent in the pavement. Not so with the new roller.

Buffalo-Springfield Roller Co. built the rollers at the insistence of contractor Geo. M. Brewster & Son Co. Brewster had experimented with torque converters on Euclid bottom-dump rigs, so was sure that a torque converter would be successful on rollers.—Const Meth & Equip, Mar, p109

One-Trip Packages

Semi-rigid, one-piece container of heavy aluminum foil holds baked goods from the time they go into the oven until carried home by the customer. It was developed by Reynolds Metals Co.

The container needs no preliminary greasing, the cakes bake evenly and quickly, and they cool rapidly. No time is spent transferring baked goods to take-home units. And the container itself is an attractive display piece.

One company is making and selling its cheese cake in this type of container. Because of its soft texture, the cheesecake could not easily be transferred from baking to display containers. Another trouble was that it had to be distributed, displayed, and sold under refrigeration. The new container eliminated all these troubles.—Food Eng, Apr, p144

From Below . . .

. . . the drafting room at Rohm & Haas Co. is lighted to over 100 footcandles with wall-to-wall Plexiglas luminous ceiling designed for low brightness ratio. Windows are gray Plexiglas with 30% transmission.

From Above . . .

. . . the cavity over the ceiling contains sprinkler pipes, wiring channels, slimline lamps, Transite ceiling painted white, and structural supports for the Plexiglas sheets. —Elec C&M, Mar, p92

NEW EQUIPMENT...

Plastic Sheets—Both the register between cutting dies and printing plates in paperbox printing and the register while engraving original plates can be checked by Vinylite plastic rigid sheets. They can be washed with plate wash and reused several times.—**Union Carbide & Carbon Corp.**—Paper Ind, Mar, p1502

Prevents Paint Sticking—Agent PB-1 prevents adhesion of paint to the curtain wall and assists the water cascade in preventing escape of paint into atmosphere. Product is mixed with water in water circulating system.—**Pennsylvania Salt Mfg. Co.**—Auto Ind, Apr 1, p57

Industrial Freezers—Models are available with cold-chamber capacities from 4 to 45 cu. ft. Temperatures of −40°, −80°, −100°, −125°, −150°, and −165° F. can be held continuously.—**Webber Appliance Co.**—Prod Eng, Apr, p242

LIGHTING UNIT BLENDS COLORS

Some mills class cotton under a new lighting unit that has colored fluorescent tubes to produce light equal in color temperature (6,000°K.) to daylight. The unit, which employs standard slimline lamps, is made by John P. Filbert Co.—Textile World, Apr, p168

Mobile Radio—New 25- to 50-mc. mobile radio communications equipment operates in 20- and 40-kc. channel widths. The 30-w. transmitter has standby battery drain of 2.3 amp. and transmitting drain of 38 amp. at 6.3 v. The 60-w. transmitter has 3.2- and 50-amp. drain. —**General Electric Co.**—Electronics, Mar, p354

Fatigue Tester—Table-model fatigue machine makes simulated service tests on small parts. Maximum of loading yoke is ½ in.; testing speed is 1,800 cycles per min. Machine has dial load indicator and cycle counter. — **Baldwin-Lima-Hamilton Corp.**—Iron Age, Apr 10, p144

One-armed Scoop—All-hydraulic three-wheeled loader has single boom tipped with a scoop. It can lift 4,000 lb. and unload at a height of 8 ft. Machine can move 120 yd. of bulk materials per hour. —**Movermobile Mfrs.**—Business Wk, Apr 5, p108

Treated Gloves—Even red fuming nitric acid will not penetrate the surface and seams of new safety gloves. They are immune even to 90% hydrogen peroxide.—**Mine Safety Appliance Co.**—Eng & Min J, Mar, p121

Printed Circuits—Compact unit combines resistor and capacitor electrical circuit, with external leads for making connections. Different circuits are available. Elements are printed on vitreous ceramic plates by silk-screen process.—**Stupakoff Ceramic & Mfg. Co.**—Elec West, Mar, p62

Fractional-hp. Motor—Model 3700 Cyclohm induction motor is rated 1/25 to 1/4 hp. It has resilient mounting base, is extremely quiet in operation. Hysteresis-synchronous and normal induction types in two-pole versions, both single and polyphase, are offered.—**Howard Industries, Inc.**—Power, Apr, p177

. . . AND MATERIALS

Grinding Head—High-speed head for internal grinding from 5/32- to ¾-in. dia. drives spindle with air turbine. Spindle and turbine float on air jets, make no metal-to-metal contact with bushings in operation. Two models cover speed range from 35,000 to 100,000 rpm.—**Pratt & Whitney Div., Niles-Bement-Pond Co.**—Am Mach, Mar 31, p 158

Hot Tape for Tubes—New heating medium looks like ordinary tape, but consists of heating elements that can be wrapped around cylinders and tubes to provide warmth up to 300° F. Flexible tapes dissipate 2.5 watts per sq. in.—**Electrofilm Corp.**—Aviation Wk, Mar 31, p67

Insulation Foils Damp—Insulating panels with a built-in wall of asphalt and kraft paper stop condensation on air-conditioning ducts. Same method for installing present semirigid insulation can be used with new product.—**Owens-Corning Fiberglas Corp.**—Business Wk, Apr 12, p142

Takes Water from Air—Electric dehumidifier in 2-ft.-high cabinet removes 3 gal. of water per day from air by passing it over copper-tubed evaporator. Moisture condenses on cold tubes, drains into 12-qt. bucket.—**Westinghouse Electric Corp.**—Elec Whols, Mar, p125

Safety for Trolley Systems—Insul-8-Bar insulates exposed conductors on overhead cranes and hoists. It can be applied without dismantling. The special sheath insulation justs snaps on.—**Benbow Mfg. Co.**—Factory, Apr, p124

Transparent Batteries—Exide type PLX batteries, in two- or three-cell units of 7 and 13 plates per cell, have clear polystyrene plastic containers and covers. Features: microporous rubber separators, slotted plate protectors, polystyrene gas baffle over each element.—**Electric Storage Battery Co.**—Power, Apr, p158

REFRIGERATOR SHELVES ROLL OUT

Frigidaire 1952 refrigerators include models with roll-to-you aluminum shelves that roll out full length on nylon rollers. All food is within easy reach. Model shown has Cycla-matic, a new system of temperature control, that maintains constant temperatures in refrigerator section by concealed chilling coils and Refrig-o-plate on back wall. Food freezer is across the top.—Elec Merch, Mar, p156

Ten-range Tachometer—Guaranteed to accuracy of ¼% of speed being measured, tachometer is suited for turbine overspeed tests, motor test stands, dynamometer test stands, laboratories. Ten ranges give over ten to one spread.—**Metron Instrument Co.**—Prod Eng, Apr, p242

Produces Open-stitched Fabrics—Circular-knit fabric with a latticework of stitches that forms a series of air vents can be made on new knitting machine. The open areas can be formed in a wide variety of patterns. Fabric is strong, full-bodied, run-resistant, and elastic.—**Supreme Knitting Machine Co.**—Textile World, Apr, p162

NEW EQUIPMENT (Cont.)

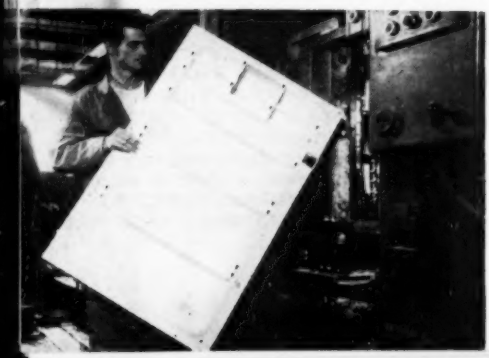
Tiny Thermostat—Miniature, adjustable, metal-enclosed thermostat has range from —50° to 350° F. Long-term stability is achieved by anchoring bimetal with ceramic bushing and by carrying moving contact on separate phosphor bronze spring.—**Thomas A. Edison Inc.**—Electronics, Apr, p287

Armored Hydraulic Cable—Armored cable contains 4, 8, or 12 pneumatic or hydraulic tubes. Cable cuts installation time and costs, besides protecting lines.—**Bailey Meter Co.**—Eng News-Rec, Mar 27, p152

Portable Oxygen Generator—Unit makes 2 tons per day of 99½% pure oxygen. It requires only air, water, and power for operation. Size is 8x7½x10 ft. Operating cost is between 5 and 10¢ per 100 cu. ft., depending on power, labor, and water costs.—**Joy Mfg. Co.**—Weld Eng, Apr, p62

LP-gas Engines—Factory-built LP-gas engines are optional on all International truck models equipped with Super Red Diamond engines. Potential fuel savings are high.—**International Harvester Co.**—Coal Age, Mar, p114

Dual-beam Oscillograph—Type 322 oscillograph has cathode tube operating at accelerating potential of 3,000 v. Stable high-gain a-c. and d-c. amplifiers are provided for both axes. Driven and recurrent sweeps are available from 2 to 30,000 cps.—**Allen B. Du Mont Laboratories, Inc.**—Nucleonics, Apr, p86



Abrasive Belts—Wetordry Tri-M-ite belts remove flash on molded glassware and ceramics, edge-grind plate and safety glass, and do other glass and ceramic grinding jobs. Belts have silicon carbide grains resin-bonded to waterproof cloth backing.—**Minnesota Mining & Mfg. Co.**—Ceramic Ind, Apr, p186

Washable Conveyor Belt—All-neoprene belt, called Supertex, is washable, odorless, tasteless, non-toxic, oilproof, and waterproof. It is offered in thicknesses of 0.010 in. and 3/64 in. and widths up to 48 in.—**Baldwin Belting, Inc.**—Food Eng, Apr, p103

Dry-chemical Fire Extinguisher—Small (5 lb.) dry-chemical unit can be easily recharged in field. Unit is charged with 150-psi. compressed air.—**Walter Kidde & Co.**—Marine Eng, Apr, p120

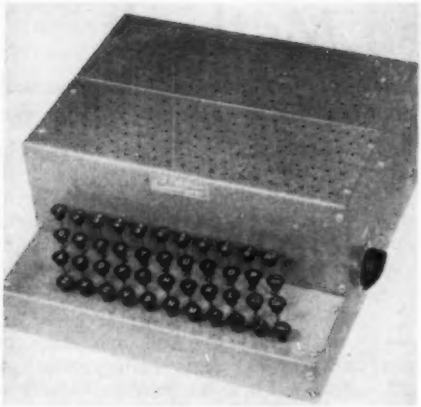
Heavy-duty Ripper—Huge center tooth alone on new ripper takes combined pull of six tractors. Machine can rip shale or decomposed granite to depths up to 60 in.—**Peterson Tractor & Equipment Co.**—Const Meth & Equip, Apr, p172

Automatic Typewriter—Compact, space-saving design of new automatic typewriter makes it suitable for small offices. Machine has 16 selector buttons for choosing letters or paragraphs carried on a perforated master roll.—**American Automatic Typewriter Co.**—Am Business, Mar, p58

Plastic Pipe Tape—Polyvinyl chloride pipe tape protects against water, salt water, acids, alkalies, oil, and soil chemicals. Insulation resistance is 100,000 megaohms. Dielectric strength is 10,000 v. It is applied cold, needs no setting-up period.—**Dresser Industries, Inc.**—Oil & Gas J, Mar 31, p132

GIANT POLYSTYRENE MOLDING

World's largest thermoplastic molding is one-piece refrigerator door liner made by Amos Molded Plastics for Admiral Corp. Molding is made of polystyrene, weighs 7½ lb., has surface of 1,240 sq. in.—Chem Wk, Mar 29, p17



AUTOMATIC MORSE-CODE TYPER

It looks like an odd typewriter, but this Codetypes does a different job—it sends Morse code. And the operator does not have to know the code. Electronic mechanism changes the typed message into the dots and dashes that go out over the radio transmitter. Device is made by Codetyper Laboratories.—Electronics, Mar, p230

Varies Speed—Variable-speed units are offered with infinite speed adjustment with ranges of 2:1, 3:1, or 4:1 at speeds of 728 rpm. and lower. Drive features are positive pulley adjustment, single-train helical gears, Herringbone rotor.—**Sterling Electric Motors, Inc.**—Elec C&M, Apr, p201

Snap-on Cone Holder—Device makes possible immediate switching from tubes to cones in creeling. No set screws or other mechanical adjustments are required. Holder snaps firmly into position, yet revolves freely.—**Edward J. McBride Co.**—Textile World, Mar, p174

Electric Brake—Large electric brake is designed for industrial service and will permit many conversions from mechanical and hydraulic systems. Size is 15 in. in dia. and 5 in. wide.—**Warner Electric Brake & Clutch Co.**—Oil & Gas J, Mar 3, p99

Shows Press Loads—Electronic strain-gage instrument, the Dieometer, measures loads in press stamping, thus showing whether press capacity equals imposed loads. Dieometer, for use on Henry & Wright dieing machines, gives load pattern on oscilloscope and load in tons on meter.—**Emhart Mfg. Co.**—Am Mach, Mar 17, p174

Low-priced Resin—New thermoplastic resin, called S. P. Asphalt Resin, is made from petroleum. Recommended uses: asphalt tile, internal sizing of kraft paper, sealing compounds, adhesives, waterproofing, as tackifier for synthetic rubbers, as extender for rubber compounds.—**Atlantic Refining Co.**—Chem Eng, Mar, p200

Safe Lighting Fixture—Model AA-51 explosion-proof fixture offers greater safety, easier maintenance, better efficiency, faster servicing than older models. It has full-circle venting, is available in sizes from 60 to 500 w.—**Appleton Electric Co.**—Elec World, Apr 7, p182

Mine Pump—Close-coupled vertical turbine mine pump is designed for service as a station booster, sump pump, and for shaft sinking. Motor is drip-proof and contains moisture-resistant windings.—**Fairbanks-Morse & Co.**—Eng & Min J, Apr, p115

Controls Temperatures—Compact, direct-reading, indicating pyrometer controller, model 293, offers inexpensive means to control furnaces, kilns, plastic molding equipment. It is available in wide range of scales using various thermocouples.—**Wheelco Instrument Co.**—Chem Wk, Mar 29, p41

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New Papermaking Methods

From how to recover sulfur from flue gases to new polyamide resins was the papermaking fare fed to 1800 top industry men

PAPER MEN from the U. S. and Canada took home plenty of good ideas from the recent 38th annual meeting of the Technical Association of the Pulp and Paper Industry. Here are samples of the current problems discussed and the new methods revealed:

1. Practical process permitting sulfur recovery from flue gases emitted from burning ammonia-base spent liquor was demonstrated. Process concentrates liquor on Conkey flat heating surface, burns it under a boiler, then scrubs flue gases with ammonia solution to recover 100 to 125 lbs. of sulfur per ton of pulp.

2. A new method for barking logs was described as consisting of chipping logs with bark attached, screening, and then separating the bark from the chips in air-flotation equipment. Drum barking of freshly-cut oak logs takes twice as long as barking pine logs.

3. Modern trends have caused a tremendous expansion of semichemical pulping. A more recent development is the production of bleached semichemical pulp that is useful in many grades of paper and paperboard. Burst, tensile and tear strengths are higher than those of bleached softwood sulfite. Of the three semichemical processes—neutral sulfite, sulfate, and cold caustic—only the neutral sulfite process is used to make bleached pulp.

4. Ignition temperatures of sulfite and kraft pulps were shown to be 264° C., while those of groundwood and semichemical pulps and wood were 210° to 230° C. Lower ignition temperatures of the latter were attributed to presence of lignin and hemicellulose, which have an ignition temperature of 180° C.

5. Three factors were stressed as to the design and operation of corrugators: (1) design and production of a flute contour to produce board of high strength, (2) maintenance of adequate temperatures at surfaces of corrugator rolls, and (3) proper adjustment of adhesives mechanism to achieve adequate bonding without distortion of formed flutes.

6. Reported was the production of purified sulfite and sulfate aspen pulps suitable for chemical conversion. Pulps were made by ammonia-base sulfite and prehydrolysis-sulfate processes. They were then acetylated and made into yarns as strong as those made from commercial pulps.

7. Five types of polyamide resins are now available in water dispersions. They are readily deposited and dry rapidly. To get a continuous film, deposited resins must be fused within a few minutes at 120° C. Fused film shows high resistance to water, water vapor, grease, dilute acids, alkalis, solvents, and chemicals. Polyamide suspensoids are compatible with polyvinyl acetate emulsions, producing blends of desirable quality. They can be made compatible with rubber latices, vinyl and acrylic emulsions, rosin and wax emulsions, casein dispersions, and other materials.—Paper Ind, Mar, p1457

PRINTED PARTS SAVE MONEY

Complicated microwave components can be made in minutes rather than months by technique developed by Federal Telecommunication Labs of International Telephone & Telegraph. Method uses foil-coated plastic parts to replace complicated plumbing units. Shown are relative sizes of microwave receiver components. Small strip costing $1 replaces 15-lb., $700 magic T transformer. Large flap attenuator is replaced by new 3-in. plastic strip. — Electronics, Apr, p10

Spring-Supported Subgrade Measures Road Deflections

A mechanical subgrade is aiding pavement design studies being made by the U. S. Civil Aeronautics Administration. Key elements of the test apparatus are 3,600 spring-supported steel plates, 2 x 2-in. square, that form a level bed 10 ft. square on which actual pavements can be built and tested.

Each spring operates within a rigidly supported cylinder. Each has been calibrated so that the vertical movement of the plunger by which it supports the plate gives a measure of the load it is carrying. Movement is measured electrically.

Loads are applied to the pavement with hydraulic jacks, using plates (10 to 30 in. in dia.) or with airplane or truck tires. Some dual-tire load tests were made.

Data collected to date are too limited to permit definite design conclusions to be drawn. Tests with dual tires indicate clearly that their use is equivalent to a substantial increase in pavement thickness.—Eng News-Rec, Mar 13, p58

Enamelers Can Save Nickel

Nickel and nickel salts are scarce. Prolonging the life of the nickel bath saves nickel and therefore should be encouraged in enameling plants.

The best method is filtering of the bath, but to make the filter effective the iron must be converted to a readily filterable form. This can be done by adding oxidizing agents.

When nickel deposits on iron from a nickel sulfate bath, iron goes into solution as colloidal iron and causes trouble in creating a nickel strike on metal sheets. Oxidizing agents precipitate iron in larger particles that can be filtered out.—Ceramic Ind, Mar, p61

Automotive Equipment Under Artic Conditions

The U. S. Army Field Forces in Alaska is running a series of tests on combat vehicles under temperature conditions ranging from —70° to 90° F. Some of the developments are:

1. New subzero oil has a pour point of —50° F. Its effective range is —50° to 30° F.
2. A new rubber compound for fan belts retains its flexibility at —65° F.
3. A new low-temperature tire remains flexible down to —54° F., but has the same characteristics as normal rubber tires at average temperatures.
4. External heaters provide heat for engine coolant, battery, and crankcase during warmup period.
5. Rubber seals are unsatisfactory. No really effective seal material has been found yet.—Auto Ind, Apr 15, p35

Chemical-Industry Notes

► Lithium compounds are now being produced in a pilot plant by Foote Mineral Co. Process uses no sulfuric acid, so no intermediate lithium sulfate forms. Instead, the process produces lithium carbonate, chloride, bromide and hydroxide. Foote will complete a commercial plant in a year.—p101

► More cold rubber (25% more) and lower costs are the results of a new process that mixes cheap petroleum-base oil with synthetic rubber latex in the ratio of 25 to 100. Addition is made between blending and coagulation steps. Oil is added as an emulsion (60% oil, 40% water, plus sodium oleate as the emulsifier). Several plants are converting to the process.—p213

► Simplified direct filtration and extraction process, developed by Southern Regional Research Laboratory, yields superior crude oil and useful meal product from cottonseed. Less than 1 lb. of hexane as the solvent is needed per lb. of cottonseed.—Chem Eng, Mar, p225

Cure for Tuberculosis?

The next 2 years will tell whether or not the new drug discovered by Hoffmann-La Roche, Inc., and E. R. Squibb & Sons is a certain cure for tuberculosis. Only 200 patients have been tested so far; most showed remarkable improvement. Time will tell if improvement is permanent. Drug is not in production and will not be until U. S. Pure Food & Drug Administration accepts it.—Business Wk, Mar 1, p22

Tests Steam Catapults

A high-performance steam catapult, designed for launching the most modern carrier aircraft at higher speeds, has been developed by the British Admiralty.

A slotted cylinder is the major unit of the catapult. The aircraft to be thrown off is attached to a hook fastened to a piston. This piston is driven through the slotted cylinder by high-pressure steam from the ship's boilers.

Steam requirements for sustained operations are considerable. But trials have shown that the demand upon the boilers can be met without interfering with satisfactory operation of the ship. —Aviation Wk, Mar 24, p32

The Battelle Story

Did you read "Export Research for Hire" on page 19? It shows what benefits stem from industrial research, tells how American industry has taken advantage of Battelle's know-how, and announces that Battelle is now opening its European doors to European companies. If your company needs a shot of research medicine, look this story over for ideas.

Report to Management

Factory of the Future

- The parts are ready for automation
- A new concept will use today's technology
- Management will face new problems
- Tomorrow's factory may serve many purposes
- Today's new plants are part of a trend

The April issue of FACTORY MANAGEMENT and MAINTENANCE reports on the organization, components, materials, and design that will go into the factory of the future. FACTORY'S poll of management and engineers shows that their forward thinking, if not their current planning, is tuned to the evolution ahead. Most experts are agreed that vast changes are coming up in plants, personnel, and production. The world's population is on the upswing. One way of increasing productivity and thus meeting demands of the increased population is through technology. Now turn the page for a digest of FACTORY'S report.

Factory of the Future

This Automatic Plant Could be Built Today

All the components for an automatic factory exist today; all that has to be done is assemble the pieces. But it needs new thinking

ORDERS could be placed this afternoon for the machines, equipment, and control devices necessary for the plant diagrammed on the opposite page. Automotive pistons would be turned out without a single operator. Of course, a maintenance crew would still be needed. But the basic machines—and the technological know-how to modify them—are on the market.

That is the conclusion of a report titled, *Making the Automatic Factory a Reality.* It was prepared by engineers in the manufacturing course at the Harvard Business School.

Here is what the Harvard group said:

"A great gap must be closed before automatic production can in any significant sense become reality. That gap is primarily informational. Most manufacturers do not know what is technologically possible in the way of automatic production. Nor do they realize in what terms they must think in order to usefully apply this technology. . . .

"So long as one's thinking is not confined to duplicating motions presently performed by the human hand, and so long as one can think of what a possible variation in product design or process could accomplish, there is every reason to believe that much more could be done automatically. . . .

"It is difficult to describe what such basic 'rethinking' consists of. It starts with the ability to look at the functions performed by an end-product and to ask whether some other product, made by a process more suited to automatic control, could perform the functions which the user now expects of this product."—Factory, p74

The Technology Is Ready

New production equipment and methods are ready for the factory of the future. Already some plants have partly switched to automation

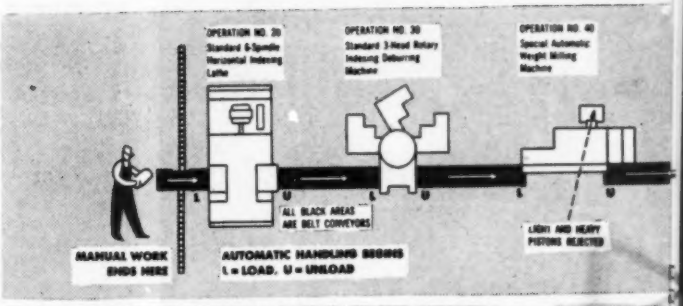
PLANTS in the future will be much more automatic than they are today. The trend is definite—it can be seen in the whole, in bits and pieces in many plants. It is obvious in the process and mass-production industries. But automaticity can develop rapidly in job-lot manufacturing as well. The equipment is here; it is the concept of automatic operation that is needed.

Regardless of the type of industry—whether some operations can be made automatic or whether methods can be improved—the equipment and methods discussed here highlight the trends toward the factory of the future.

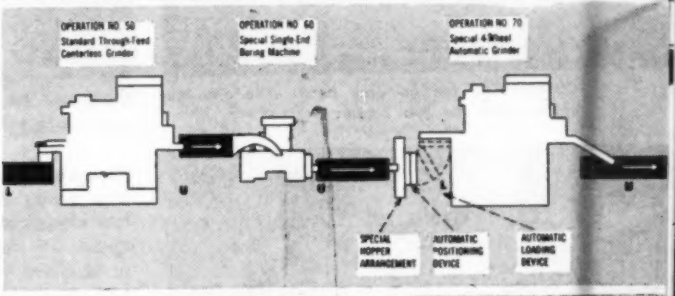
Several operations will be combined into one. A machine in the Cleveland Tank Plant of General Motors' Cadillac Division is an excellent example of the trend toward combining machines

For more on today's technology and tomorrow's plant, turn to page 60.

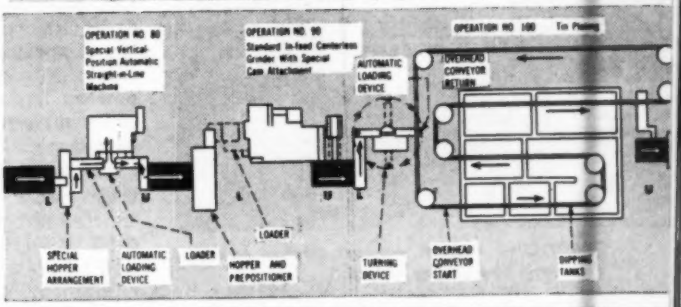
***NO MANUAL WORK** takes place once rough piston is placed on a conveyor belt to first finishing operation.*


OPERATION NO. 20
Standard 6-Spindle Horizontal Indexing Lathe
OPERATION NO. 30
Standard 3-Head Rotary Indexing Deburring Machine
OPERATION NO. 40
Special Automatic Weight Milling Machine
ALL BLACK AREAS ARE BELT CONVEYORS
LIGHT AND HEAVY PISTONS REJECTED
MANUAL WORK ENDS HERE
AUTOMATIC HANDLING BEGINS
L = LOAD, U = UNLOAD

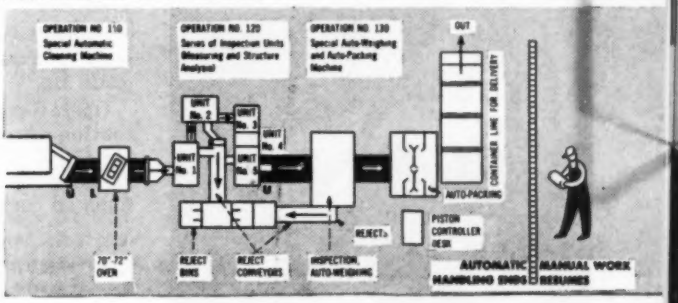
***PISTON PROCEEDS** from operation to operation via the conveyor belt. Loading, unloading are automatic.*

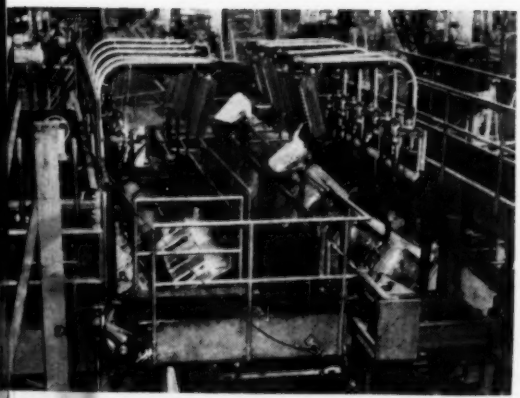


***NEARLY ALL** machines are standard with attachments suitable for making pistons. Maintenance is necessary.*

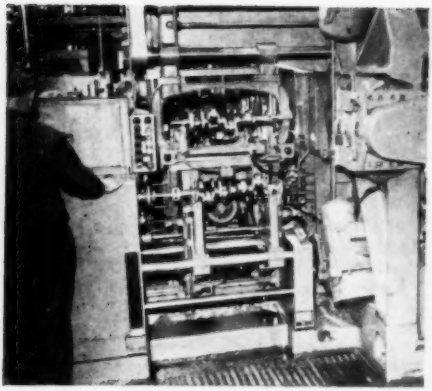


***ALL INSPECTION** operations are automatic. Packing is last automatic step. Manual work picks up from here.*

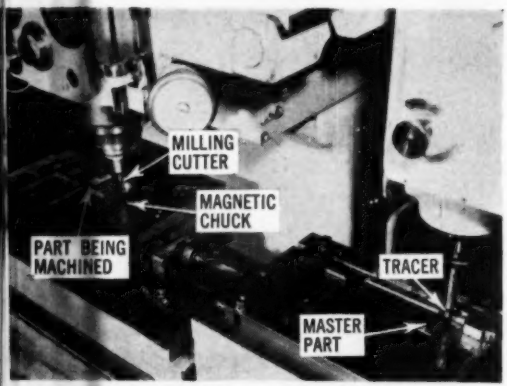




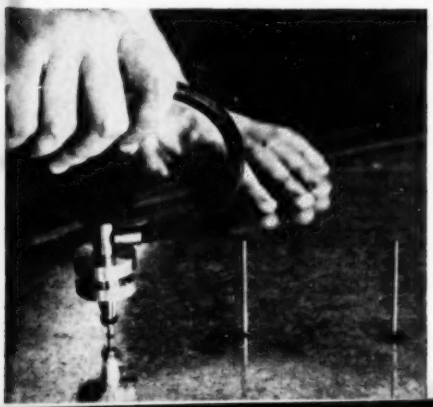
COMBINING ten grinding heads into one machine does the job faster.



MACHINE BALANCES and corrects balance of crankshaft without interrupting production.



PROFILING MILLER employs tracing principle; increases low volume output.



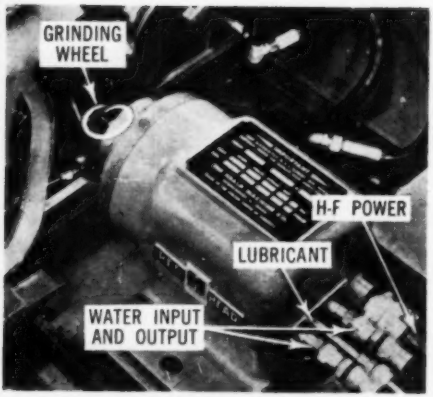
STUD WELDER joins practically any combination of metals with machine-gun speed.

to speed production. It has ten grinding heads that operate independently, but simultaneously. They grind selected spots on tank hulls.

Another machine has ten reciprocating drill heads of ten drills each—drills 100 holes at one time in a hull. These special machines reduced investment in equipment. They cut manpower requirements, saved space, reduced in-process inventory, speeded output.

Before components can be combined they must be standardized. The U. S. Joint Industry Council has done a lot of work on standardization. They had three things in mind—type of equipment, method of installation, and safety of equipment. Specifications for the application of electrical, pneumatic, and hydraulic devices have been made up.

Operations will be combined into a continuous process. The Nash-Kelvinator Corp. bought a 24-station transfer machine to combine machining operations on compressor castings. Designed



HIGH-FREQUENCY wheelhead grinds small bearing race at 100,000 rpm.

to produce 188 pieces per hour at 80% efficiency, it consistently processes more than 200 per hour. Quality? It scraps only one or two pieces a week! Four operators control all 24 operations.

When the machine was near completion, the men who were to supervise its operation spent 2 weeks in the builder's plant to learn how it worked. The machine's excellent performance record proves the value of this training.

Preventive maintenance right down to tools will be a must. Ford Motor Co. uses a tool-control board in the capacity of preventive maintenance. The board stores tools and automatically records life of tools in operation in multi-station transfer machines. Pre-set counting dials equipped with automatically operated lights signal warnings to machine job setter when a particular drill, reamer, or tap requires changing. This new tool-control method avoids costly shutdowns of machines, reduces tool breakage, and improves quality of machining work.

Low-volume, but repetitive, operations will have automaticity with profiling machines. Output is really stepped up by a profiling machine—big increases up to 600% are reported.

With a profiling machine, one master part is made. A "tracer" device moves along the profile of the master. The machine follows the same path as the tracer, duplicating the part. The method is coming into use in metalworking, but can have wide application elsewhere.

Robot machines will make job-lot production automatic. A tape-control system of machining can be applied to any general purpose machine tool. H. H. Cousins & Co. has a system that works like this: Specifications for the part to be machined are punched into a tape. A sensor "reads" the punches and translates them into electrical impulses that drive the machine that makes the part.

The big advantage for the job shop or tool-and-die shop lies in the fact that once the tape has been punched, it can be filed for use weeks and even months later. When the job is to be repeated, the tape is put in the sensor and the part in the machine. The rest is automatic.

In a further refinement, master tapes for commonly used arcs, tapers, and flat surfaces could be made. Simply fastening the tapes together would give a complete tape for the desired part.

Machines will run at higher speeds. But, before they can run faster, a lot of traditional rules of thumb will have to be discarded. Take metalworking as an example.

The new approach to determining optimum machining rates is based on the microstructure of the metal to be cut. With data on microstructure and the cooperation of metallurgist and product designer, the production supervisor can find the best machining rates and tool life for the products. In some cases, knowing optimum machining rates allows more effective use of existing machines. In other cases,

the knowledge will help justify newer, faster machines.

For higher-speed jobs, newer processes will be designed—the traditional ones will not be speeded up. Important big gains in productivity come from a different approach to performing the necessary operations in making a given product. To cut corners on present methods is not enough.

Products will be redesigned for ease of manufacture and upkeep. The printed circuit is a good example of the type of design change that simplifies both product and machine component. In one case, it will help make automatic, or nearly-automatic, operation. In the other, it will speed repairs, and cut the vital downtime.

Small quantities will be made by more economical methods. "New-approach" methods will make short runs cheaper. Take short-run stampings.

One method for cutting die costs is the use of rubber in suitable form to replace the female die. For large drawn stampings, two other methods cut die costs: (1) stretch forming and (2) nonferrous dies.

More processes will be converted to continuous flow. Most continuous flow processes were once batch processes. Ability to conceive and execute the idea of continuous flow converted them also boosted present employee output.

Materials handling will be integrated with processing. The objective will be to take work out of one machine and deliver it not only to but also into the next machine without the need for manual handling. Machine utilization is increased and machines are operated at optimum speeds. Result: better quality, space saving, smaller machine investment.—Factory, p85

Factory of the Future

Management Problems Will Be Different

Getting ready for tomorrow's plant will help management today as management methods are changing as fast as the factory changes

THE MANAGEMENT SETUP of today, by which compartmented departments report directly to one chief, is due for a big change. The automatic plant will have two levels of decision: one between management and the usual specialized departments, the other level below these departments.

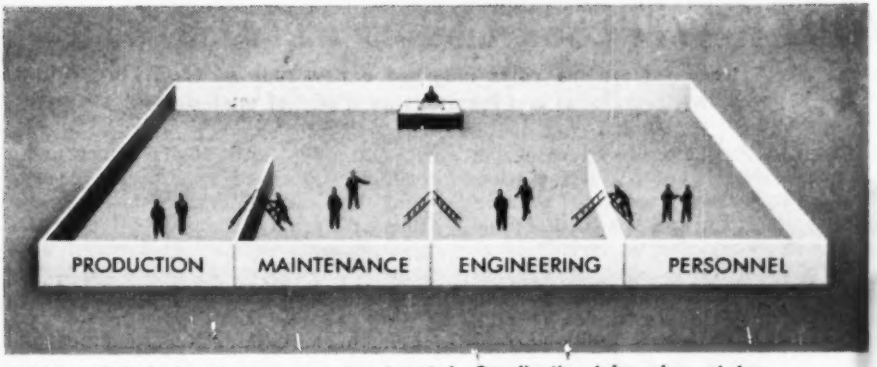
The biggest single job of management will be allotting and coordinating the activities of the specialists, say, in changing design and production schedules. Possibilities for errors in judgment will be greater.

The robot plant will call for bigger investments simply because the machinery is more complicated. A bad decision in buying a piece of equipment will be costly, and possibly fatal. Much downtime on the wrong machine will not be tolerated. It will be tied in too closely with the rest of the plant.

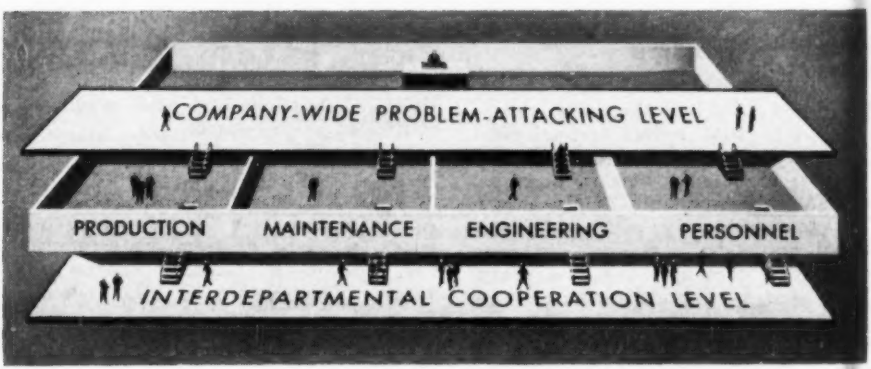
In the automatic factory, operating decisions will have to be made so fast that there will not be time to go up through the chain of command. Decisions that will affect the whole life of the company will have to be made by technical experts, at relatively low management levels. Someday, the skilled workers will manage, not operate, a plant.

Their specialties will be in broader fields such as electronics, metallurgy, or physics. The judgment that they use will need almost the same accurate

"Future plants will have two levels of decision . . ."



TODAY, industry's departments are compartmented. Coordination takes place at top.



TOMORROW, there will be two levels of cooperation. Technicians decide for lower level.

timing that has been built into the machines. The experts who forecast marketing conditions, for example, will have to make more accurate predictions on demand and slumps. On their decisions will depend those of the manager of raw materials, who will have to control plant inventory with only 1 or 2 days' margin.

These lower-level experts will make up nearly all the plant personnel. There will be only a few unskilled workers for the heavy, nonroutine work. That means a big training problem ahead, one that will take time and money. The plant designer will pretty well determine the scope of training. It will be his job to build near-human judgment into the machine. And the know-how of the workers will have to be a few jumps ahead of the automatic controls. Equipment and machines will become much more complex. Workers will have to match that complexity with their skill.—Factory, p100

Factory of the Future

What It Will Look Like

A trend toward the cities may see a new type of factory emerging with new techniques and materials as a part of multi-purpose structure

A NEW GROUP of engineered values is being injected into industrial facilities. Plant designers are seeking greater building efficiency and speed. Flexibility and economy are universal objectives. Standardization and integration are the means of attaining them. The speedy advance of electronics is projecting mass-production industries toward automation and giving a new dimension to materials-handling functions.

Progress in One Step

The industrial plant must encompass in one giant leap the many endless little jumps that reflect technological progress, the variations in process and products, the fluctuations in business, and changing occupancy. Only as the plant can be easily converted, augmented, expanded, salvaged—or even moved—can it be operated at a profit.

The need to provide parking areas and space for expansion has led most companies to new plant sites away from built-up urban areas. But labor and cheap mass transportation are concentrated in the metropolitan centers. So a limited counter-trend—leading companies back to the cities—may get started. It could even bring the erection of buildings with two to six stories of industrial space and anywhere from 100,000 to 200,000 sq. ft. per floor rising in the very heart of industrial centers.

Recent developments make such plants more likely. Progress in the field of prestressed concrete, for instance, together with the availability of lighter aggregates, should make it possible to build multi-story plants with 40-, 50-, and 60-ft. spans and generous overhead clearance. Wide spans and large uninterrupted open areas of floor space would give most light manufacturing industries the straight-line operating advantages to be obtained in a single-story building.

The ground floor space could be leased to suitable commercial establishments and modern attractive tower apartments or offices on the roof of the plant would spread the land cost.

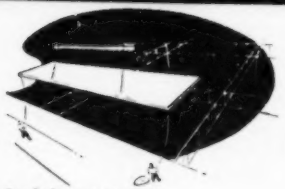
Utility services would be distributed vertically through the central core, which would also contain ventilating shafts. Vibrations and noise would be controlled at the source.

Provision for parking, storage, and for receiving and shipping by truck or rail could be made in the basement. Access to and from the manufacturing floors would be provided by ramps at the ends of the building and/or elevators. They would be large enough to carry the largest truck trailers to and from individual depressed docks on each level.

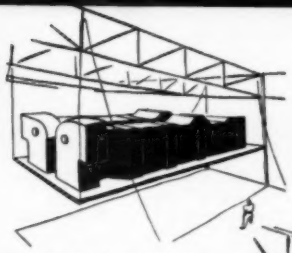
In the future, speed in getting a new plant into operation will be most important. Basic thinking and comprehensive knowledge of the factors that affect location, construction, production, manpower, and costs will be vital.

New Developments Lead Way

Advances in design will enable companies to settle the primary questions of spatial requirements and structural characteristics long before the details of operation and layout have been settled. Development of the "free-

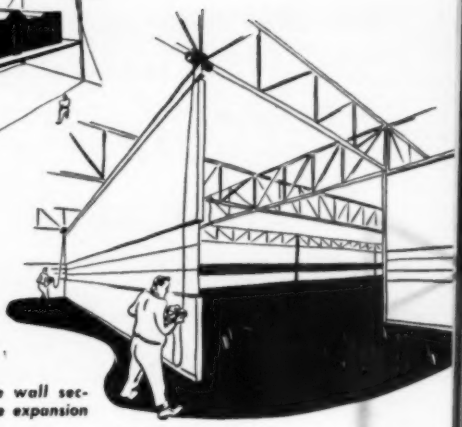


Prefabricated roof panels speed erection



Standard platform units save time

Mobile unit sprays plastic roofing



Movable wall sections ease expansion

***FLEXIBLE DESIGN**, erection speed, easy maintenance will be part of tomorrow's plant.*

loading" H-section truss, for instance, allows accommodation of shifting loads without special design. Commitments for framing can be made before the location of either overhead handling systems or other building equipment has been determined.

Ventilating and air conditioning systems will be prepackaged for easy integration with the structural frame. Components will be interchangeable. And assembly time will be low.

Other techniques and materials that will be featured in the factory of the future include:

- Better materials.
- Larger building components.
- Wider column spacing.
- Prefab roof panels.
- Lighter concrete aggregates.
- Modular units.

Materials handling is due for even more attention than it is getting today. Tomorrow's handling will employ point-of-use storage, greater flexibility, mobile overhead storage, and electronic control. All the problems encountered in receiving, storing, and processing of materials, and in moving them around are due for a comprehensive analysis. Then only will management receive the full benefits of mechanization.

Lighting will see some changes, too. Lighting engineers have been approaching the ultimate of over-all surface lighting comparable to the sky.

Systems using "egg crates" and continuous plastic ceilings placed below fluorescent light sources are too costly for the average industrial building. But they are probably the forerunners of some system by which the ceiling itself will become the source.

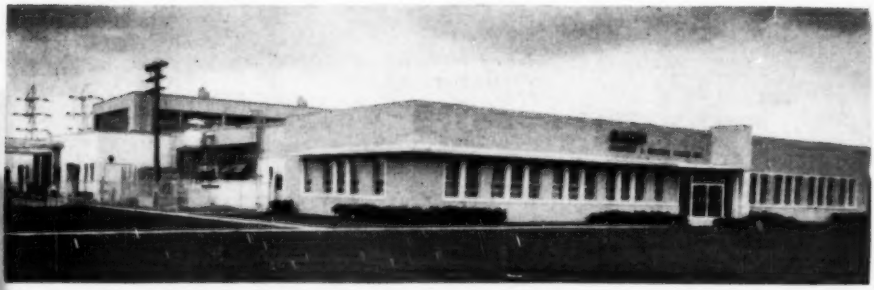
Neither will employees be forgotten. Enlightened self-interest will lead to the adoption of many building refinements that increase efficiency, reduce maintenance, and improve working conditions.

Wider and better-informed functional use of color for the sake of economical maintenance, accident prevention, greater productivity, and quality control will automatically reduce monotony and eye fatigue.

Dust control, well-kept grounds, and recreational facilities will all keep pace with the development of the factory of the future.—Factory, pB-83

This Plant Follows a Trend

Barth Stamping & Machine Works, Inc., Cleveland, Ohio



A NEW PLANT can be more than just a better place to work. Methods too can be improved

New Plant Inspires New Methods

PEOPLE who move into new plants have a better place to work. They have a brand-new chance to analyze old methods—and improve them. They find, in the new plant itself, real inspiration to come up with better methods.

Barth Stamping & Machine Works, Inc., is a small company turning out dies, small stampings, and specialized machinery. Its move into a new plant was accompanied by a burst of better methods.

Some of the highlights are:

Size of plot plant rests on is 8½ acres.

MACHINES are grouped for maximum supervision with few supervisors.

Location of the plant is 100 ft. from a 4-lane highway.

Future expansion will find plenty of room available.

Sidewall construction is of concrete block topped by continuous operable sash. Above the sash are corrugated asbestos sheets.

Roof construction is conventional felt, tar and gravel.

Floor construction in the forward bays is woodblock. The high-bay floors are concrete. Office floors are asphalt tile.

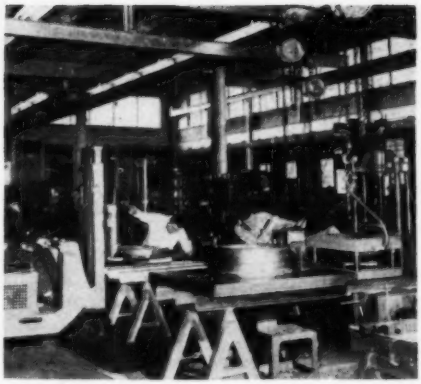
Frame construction is riveted steel, designed to carry an additional 2-ton suspension from any one point.

Plant heating is by gas-fired unit heaters. In the offices are fin-tube radiation, hot-water units.

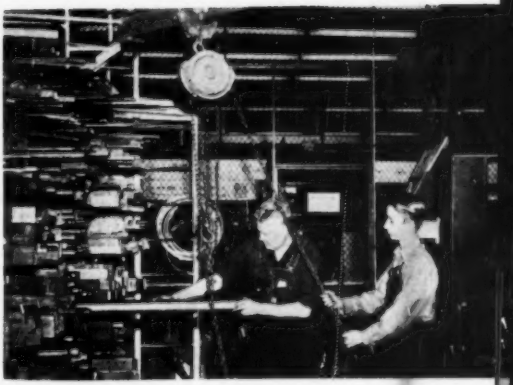
Plant lighting is by fluorescent lights throughout.

Layout is functional. Grinders, lathes, millers, and presses are grouped in departments for effectiveness and economy of supervision.—Factory, pB-106

On the next page are typical better methods inspired by the new plant.



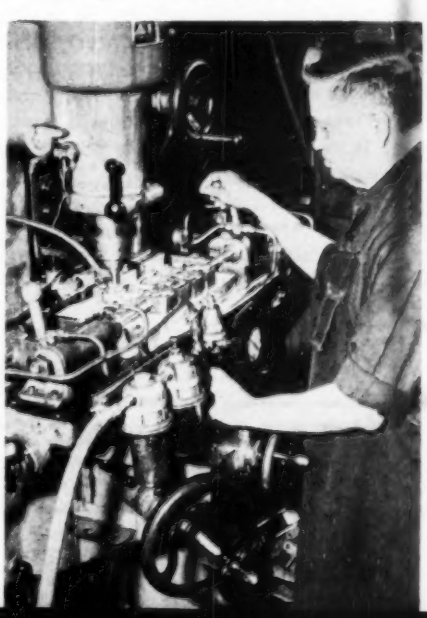
Flexible tables speed die work. These simple welded tables support dies weighing several tons. Dies can be placed on the tables either by fork truck or by overhead hoists. Over each table is a 2-ton hoist that helps the diemaker move the dies around on the table. With five tables and five hoists, diemaker has his own complete work area, can work unhampered by lack of equipment space.—Factory pB-111



Swinging jib simplifies bar-stock storage. An I-beam, pivoted at one end and used as a jib, is centered above the bar-stock storage rack. It supports a hand-operated ½-ton hoist that can roll the full length of the 8-ft. jib to support the weight of bar stock being removed from or placed in the rack. Although two men are shown removing the bar stock, it is an easy 1-man job.—Factory, pB-110

Clamping fixture speeds milling. Two single-spindle milling machines equipped with hydraulic clamping fixtures turn out 100 pieces an hour. Each machine holds four pieces at a time. One operator runs two machines. Output from the machines has increased more than 200%. The installation consists of two hydraulic valves and two hydraulic cylinders.

When the lever at right (in operator's hand) is thrown, pistons of the cylinders on each side of the fixture move forward and enter holes in the fixture and in the pieces being milled. Piston shafts meet at the center of the fixture after having locked the four pieces in place. The two milling machines are cycled so that one machine is operating while the other is unloaded and loaded.—Factory, pB-108



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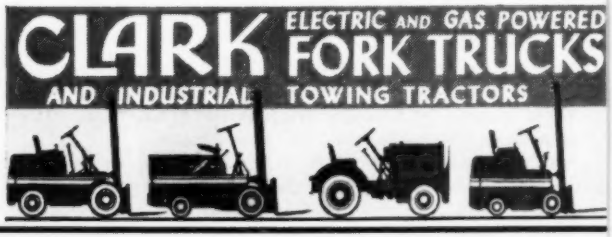

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PRODUCTION IDEAS

from Manufacturers' Catalogs

6-1 Recorders and Controllers—Minneapolis-Honeywell Regulator Co. 40p. Complete information on pH and conductivity recorders and controllers is given in catalog 15-16.

6-2 Where To Sell in Latin America—National City Bank of New York. 48p. Informative booklets discuss present and future economies of Peru, Panama, Venezuela, and Uruguay.

6-3 Industrial Furnaces — Westinghouse Electric International Corp. 38p. Twelve types of gas and electric furnaces are described in booklet B-5459, entitled, "Harnessing Heat".

6-4 Dry Cleaning—American Laundry Machinery Co. 12p. Advance Technical Bulletins describe Triplex and Zuron dry-cleaning units.

6-5 Chemical Fibers—E. I. du Pont de Nemours & Co., Inc. 32p. "This Is Du Pont —Man-Made Fiber" reports on the development and rise of Du Pont's five chemical fibers—rayon, acetate, nylon, Orlon, and Dacron.

6-6 Magnesium — Dominion Magnesium Ltd. 11p. Bulletin covers specifications and mechanical properties of Dormal high-purity magnesium and magnesium alloys.

6-7 Testing and Measuring Devices—International General Electric Co. 80p. Catalog GEC-1016 summarizes complete line of company's testing and measuring equipment for laboratory and production-line use.

6-8 Radial Engine—Nordberg Mfg. Co. 21p. Booklet has 9 unusual cut-out views of radial engine with a color code to show location of air, water, oil, etc.

6-9 Hauling and Dumping — Dempster Brothers, Inc. 12p. Form 1045 describes Dempster-Dumpster system and equipment for handling many kinds of materials.

6-10 Heating Units—Heil Co. 4p. Form AH50514 describes heating units, winter air conditioners, boiler-burner units, and conversion burners. Distributorships are available in several countries. We'll be glad to forward your letter to Heil Co.

6-11 Your Questions Answered—Monsanto Chemical Co. 8p. "The 12 Questions Most Frequently Asked About Plastics" are answered in this executive newsletter.

6-12 Synchronous Motors — Electric Machinery Mfg. Co. 12p. Application of direct-connected synchronous motors to reciprocating compressors is presented in publication 1200-TEC-1111.

6-13 Air Controls—Bendix International. 16p. "Robotair Industrial Air Controls" gives applications of air-actuated holding devices.

6-14 Vegetable Oil Extraction—V. D. Anderson Co. 52p. Four-color book, "Extracting Vegetable Oils with Expellers, Solvent, Exsolex Process", gives information on processes and auxiliary equipment.

6-15 Resins—Airco Co. International. 146p. Vol. XV of "Resinews", publication of U. S. Industrial Chemicals, Inc., has a section each on six groups of resins and a section on testing methods.

6-16 Oscillating Conveyors—Link-Belt Co. 24p. Book 2444 covers oscillating conveyors for conveying, feeding, cooling, and screening loose bulk materials.

6-17 Industrial Communication — Collins Radio Co. 18p. "Collins Signal" describes unusual methods used in communication.

6-18 Pumps—Allis-Chalmers Mfg. Co. 8p. Diagrams and features of PW pumps for use in paper industry are given in bulletin O8B7112A.

6-19 Drill Unit—Delta Power Tool Div., Rockwell Mfg. Co. 12p. Catalog AD664 illustrates 19-150 and 19-400 Air Hydraulic Drill Units in actual plant operation.

6-20 Color Control—American Cyanamid Co., Calco Chemical Div. Factors that influence color are enumerated in "Color Control in Paper Making", Technical Bulletin 824.

6-21 Spray Accessories—John Bean Div., Food Machinery and Chemical Corp. 12p. Bulletin L-844-2M-9-51-SP covers specifications of industrial spray accessories.

PRODUCTION IDEAS (Cont.)

6-22 Sedimentation Units—Dorr Co. 28p. Thickeners for chemical, metallurgical and industrial processing are covered in bulletin 3001. Also, available engineering services are listed.

6-23 Thermometers and Gages — Electric Auto-Lite Co. 16p. Descriptive information and specifications covering several types of industrial thermometers and recording gages are given in bulletins G14C, G143C, and G149.

6-24 Steel Tubing—Bundy Tubing Co. 20p. Bulletin gives excellent technical data and fabricating information on Bundyweld steel tubing.

6-25 Mildewproofing—Witco Chemical Co. 12p. Technical Service Report P-17 tells methods used for mildew-proofing materials. Summarizes government specifications.

6-26—Deburring Gears—Sheffield Corp. 6p. Catalog B380-51 gives specifications and tells advantages of the Gear Deburizer.

6-27 How To Save Tin—Reynolds Metals Co. 26p. "How Aluminum Can Save Tin" describes improved packaging methods that can replace the ordinary "tin" can. (McG-H Digest, Jan '52, p61).

6-28 Cost Comparator—Cummins Engine Co. Slide-rule type comparator calculates savings through use of Cummins diesels over gasoline engines.

6-29 Flow Meters—Bristol Co. 40p. Mechanical and electrical type flow meters in full range of models are described in bulletin F1605.

6-30 Machine Tools—George Gorton Machine Co. 12p. General information on complete line of milling, profiling, die sinking, and engraving machines is given in General Catalog.

6-31 Safe Drinking Water — Wallace & Tiernan Co. 36p. "How Chlorination Safeguards Your Drinking Water" tells the story of water sterilization from olden days to the present modern methods of chlorination.

6-32 Electric Trucks—Yale & Towne Mfg. Co. 12p. Complete line of electric fork trucks from 1,000 to 10,000 lbs. is listed in bulletin P5151.

6-33 Vinylite Resins—Union Carbide & Carbon Corp. 20p. Bulletin J-510c gives technical data on vinyl acetate resins, vinyl alcohol-acetate resins, and vinyl acetate resin dispersions.

6-34 Unit-load Handling — Baker-Raulang Co. 8p. Folder shows use of fork trucks, pallets, skids, and containers in materials handling and shipping.

6-35 Industrial Motors—Eastern Air Devices, Inc. 21p. Folder covers small subfractional hp. motors, synchronous motors, military motors, blowers for special applications.

6-36 Laundry Machinery — Troy Laundry Machinery Div., American Machine & Metals, Inc. 24p. Catalog YG-8-50 gives pictures and specifications of Troy's full line of laundry equipment.

6-37 Latin-American Business—Chase National Bank. 28p. March issue of "Latin-American Business Highlights" covers many aspects of industry in 7 countries.

These manufacturers' catalogs will be sent free to subscribers. Fill in squares with catalog numbers desired and mail to the Editor, McGraw-Hill Digest, 330 West 42nd St., New York 36, N. Y., U. S. A.

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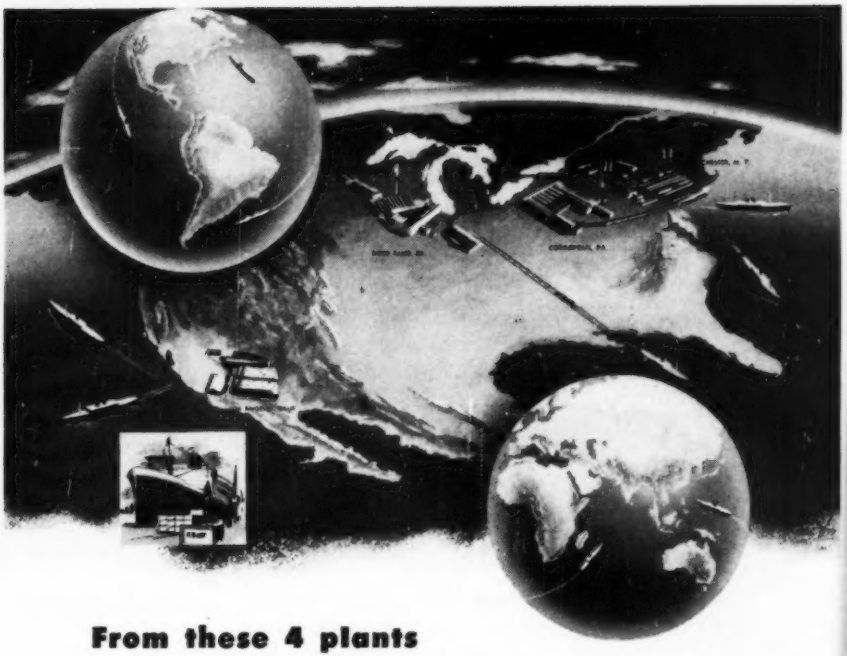

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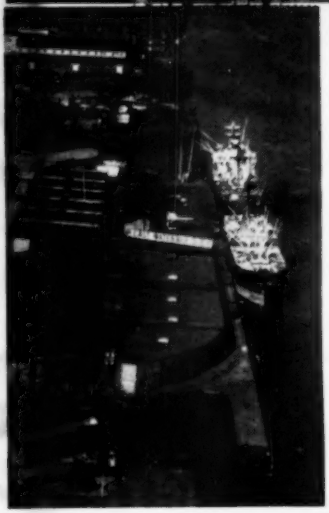

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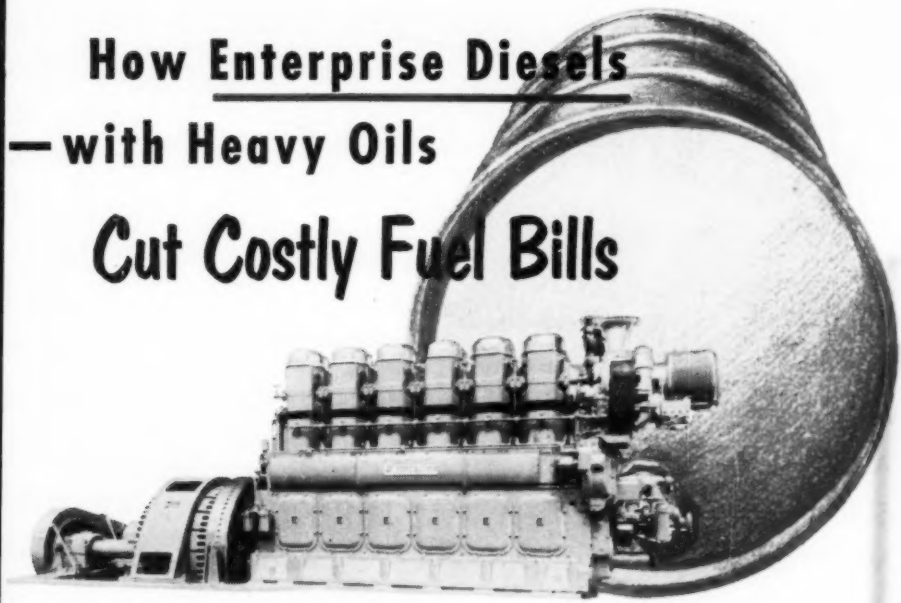

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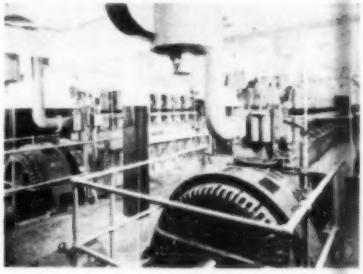

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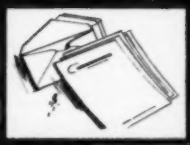

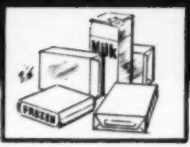

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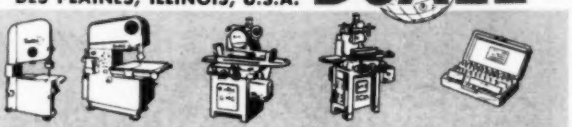

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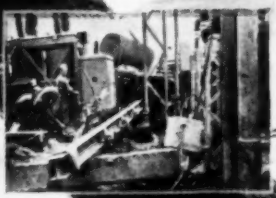

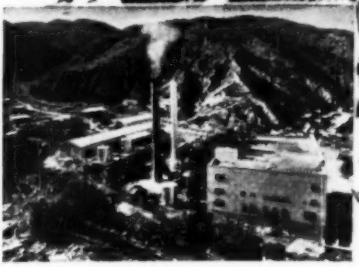

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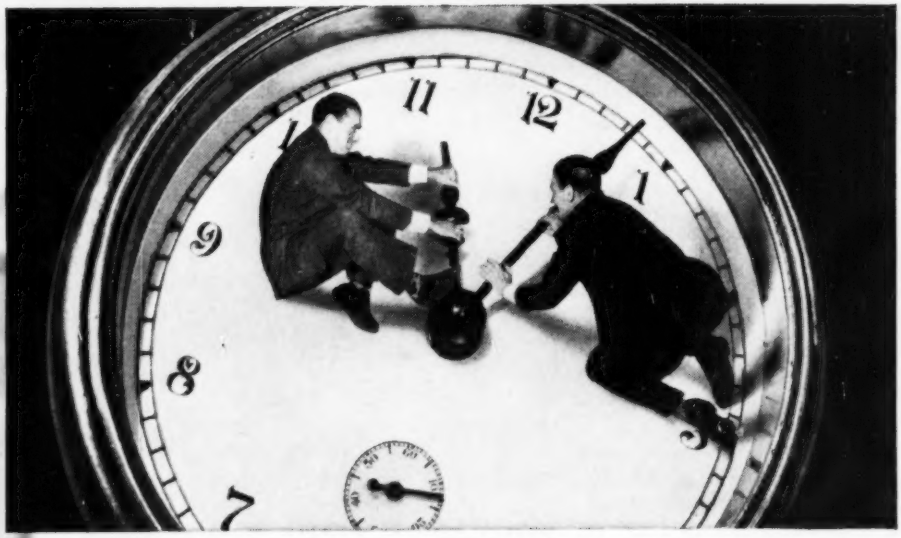

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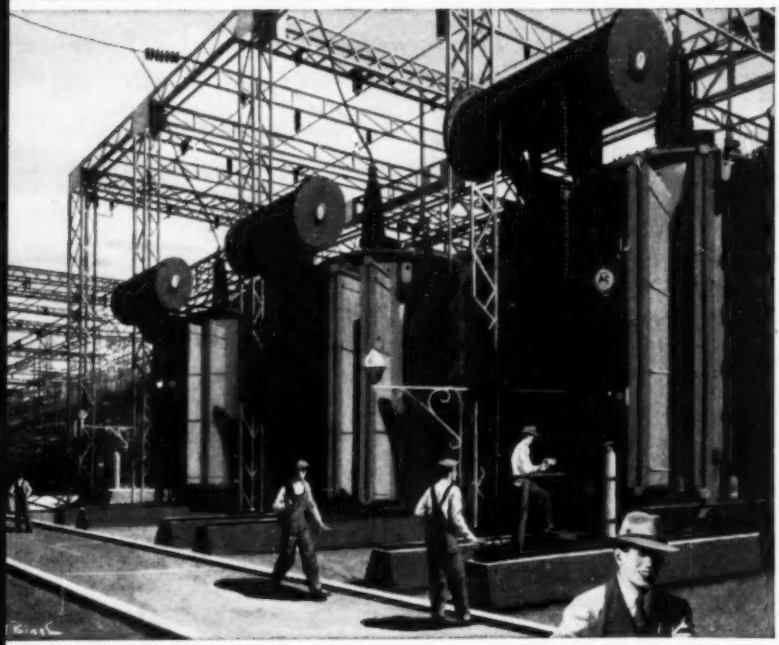

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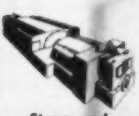

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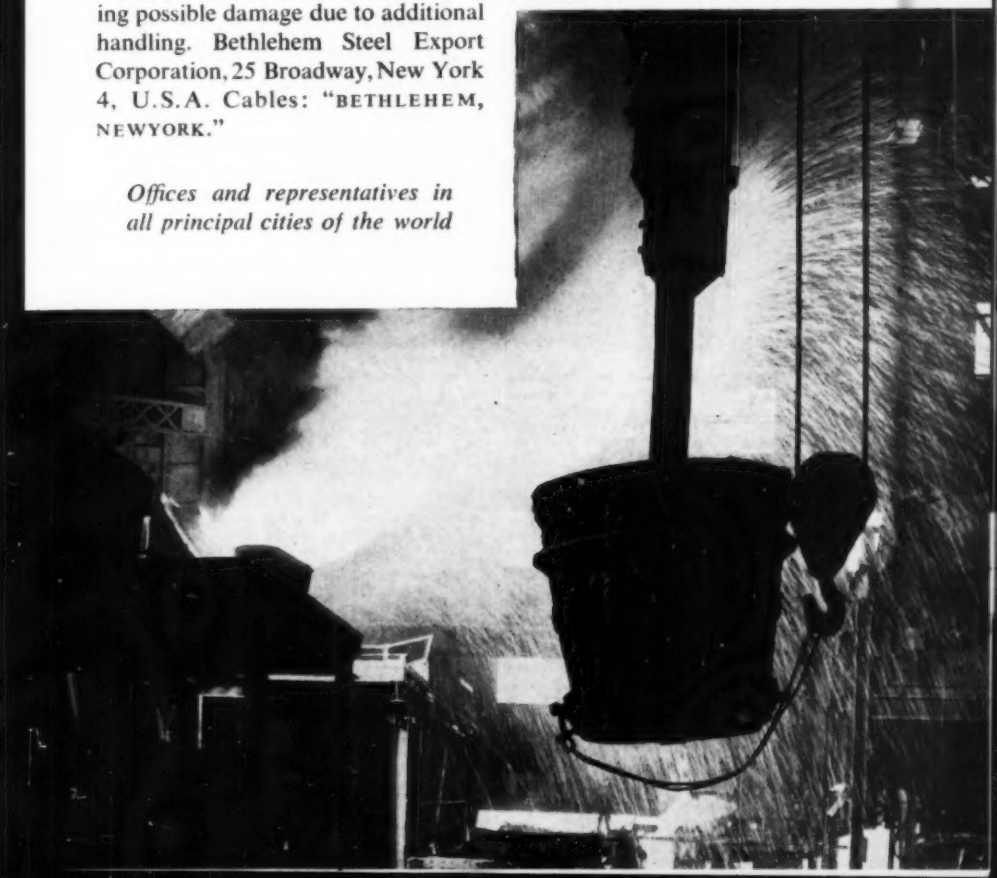

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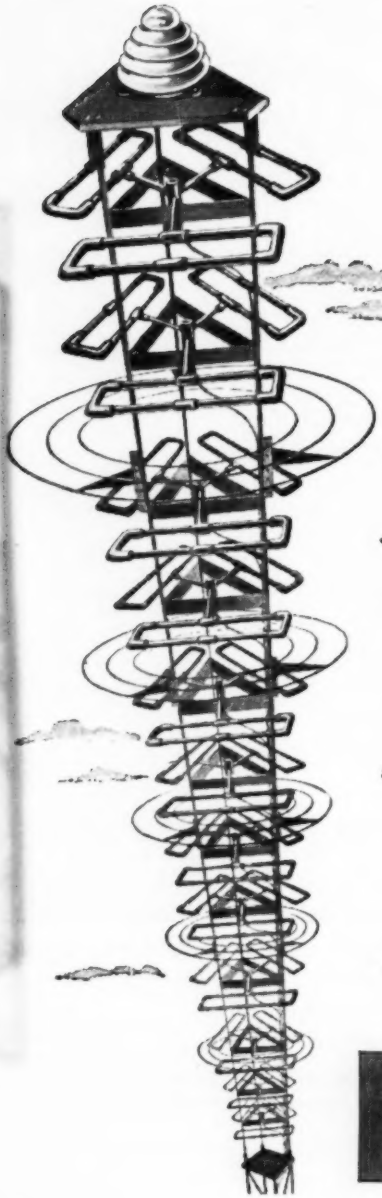

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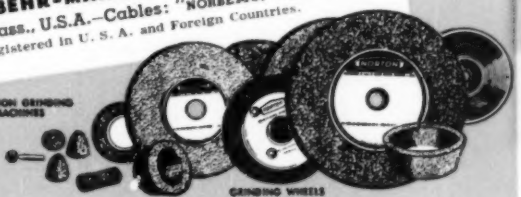

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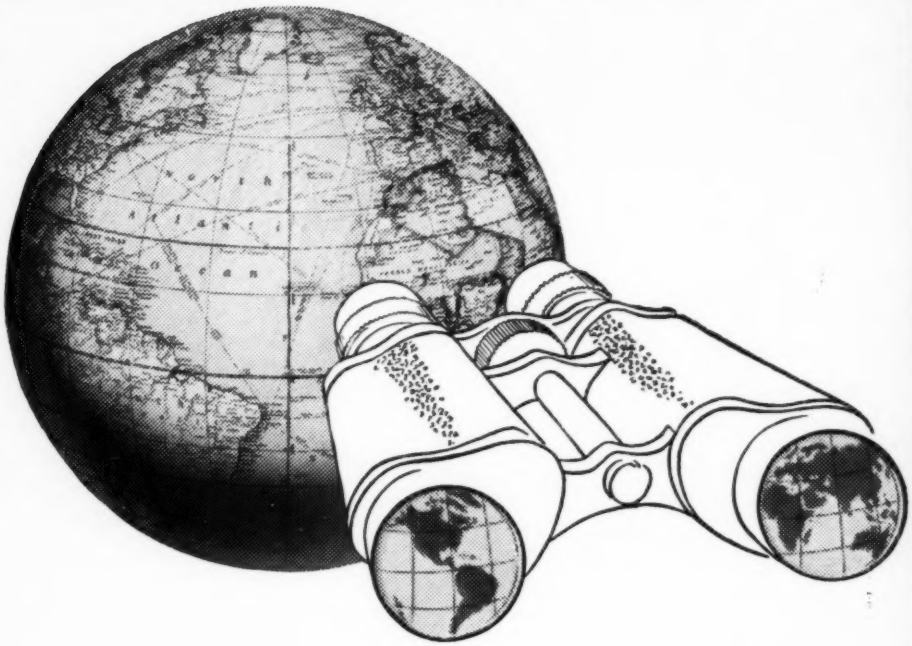

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